

Ab-normal Athletes:  
Technomedical Productions of Gender, Sports, Fairness and Doping

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## **Ab-normal Athletes: Technomedical Productions of Gender, Sports, Fairness and Doping.**

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### **Abstract**

Doping and anti-doping research laboratories are crucial sites for the production and reproduction of gender in sports. Such labs have, over time, constructed a multiplicity of gender categories through which to view and assess doping practice, but nevertheless, they consistently work hard to reproduce binary, hegemonic sex and gender categories. As part of their reproduction of the binary, I argue that technomedical researchers police gender and negotiate ethics within their research by “ab-normalizing” athletes. Ab-normalization refers to a process, adjunct to normalization, whereby gendered and racialized categories of deviance, and the means of policing such categories, are produced. Likewise, these technomedical researchers developed means of authenticating the hormonal gender of athletes. Authentication is a form of ab-normalization that represents the kind of policing that anti-doping researchers perform. It refers to the technomedical processes that produce and legitimate these hormonal gender states.

In order for technomedical researchers to do this work, they have had to negotiate ethical quandaries across different spaces. Such ethical negotiations have played an important role in shaping the direction, and thus gender possibilities, within this research. Specifically, I show how technomedical researchers often shifted ethical frames while performing their research, from a sports ethical frame to either an athletic performance research ethical frame or an anti-doping research ethical frame. The first of these is premised on notions of “fair play” while the second is guided by technomedical uncertainties regarding athletic performance and doping practices. The third ethical frame reconciles these two by producing “fair play” amongst competitors through the development of technomedical detection techniques that either catch or deter cheating athletes. This shifting of ethical frames highlights how these researchers were performing legitimate scientific research at the time and not the “immoral,” ethically dubious, research as it might appear to be from our current perspective.

To clarify my theoretical points on gender and ethics, I draw upon two cases. The first case deals with blood doping, which requires the withdrawal and subsequent re-infusion of blood into an athlete. The second case examines endogenous steroid use, particularly, androgenic anabolic “naturally” occurring steroids. These hormones aid in muscle production and recovery. Blood doping and endogenous steroid use are two key practices of sports doping. By deconstructing the science surrounding these two practices, I offer an alternative account of the doping debates from the more familiar accounts that explain the doping debates as a “cat and mouse game” between anti-doping researchers and athletes within which “doping” is often presented as a straightforward immoral act for the athletes.

By telling the story of how these technomedical researchers simultaneously produced gender categories, ethical categories, and technomedical processes, my alternative account positions these doping debates as competing, socio-historical, articulations of “fairness” bound to competing articulations of gender. I suggest that it is possible to re-imagine “fairness” from this alternative account. Specifically, we can imagine more equitable ways to allow the individuals that do not fit neatly into the binary gender system to compete “fairly” in sports.

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## Table of Contents

Abstract	ii
Acknowledgements	iv
List of Tables	vi
List of Figures	vi
List of Commonly Used Abbreviations	vii
Chapter 1. Technomedical Productions of Gender, Sports, Fairness and Doping.	1
Chapter 2. Resolving the Ethics of Uncertainty: Blood Doping, 1973-1987.	24
Chapter 3. The Emergence and Ab-Normalization of Female Blood Boosters.	53
Chapter 4. Authentic Masculinity: Early Testosterone Use and Detection Techniques.	72
Chapter 5. Detecting Authentic Hormonal Gender: the T/E Ratio as Screening Criteria.	111
Conclusion: Disrupting “Fairness” and the Binary Sex Sport System.	148
Bibliography	158

## List of Tables

<b>Table 1.</b> “Replication of ‘Table 2. Mean Hematologic and 2,3-DPG Values.’”	46
<b>Table 2.</b> “The Relations Between Normal, Non-Normal, and Ab-Normal Categories Created by Blood Boosting and Blood Doping Researchers.”	57
<b>Table 3.</b> “Reproduction of Robertson’s ‘Table 1. Hematologic Values for Women.’”	66
<b>Table 4.</b> “Replication of ‘Table 2. Stability of Steroid Profiles (female urine).’”	108
<b>Table 5.</b> “Alternative Detection Practices & Their Production of Authentic Gender.”	114-116
<b>Table 6.</b> “Replication of ‘Table 1. Distribution of Urinary Epitestosterone Concentration (microgram/L) by Ethnicity.* (*values in parentheses are in ng/mg creatinine).’”	127
<b>Table 7.</b> “Replication of the List of Urinary Steroids Evaluated in A Longitudinal Study.”	138

## List of Figures

<b>Figure 1.</b> “The Co-Production Processes.”	29
<b>Figure 2.</b> “Robertson’s Experimental Timetable.”	68
<b>Figure 3.</b> “Diane Modahl and Raija-Anneli Koskinen, a Finnish Powerlifter during the 1990s in the 44kg weight category.”	102

### **List of Commonly Used Abbreviations\***

2,3-diphosphoglycerate, 2,3-DPG

American College of Sports Medicine, ACSM

Analysis of Variance, ANOVA

Coefficient of variation, CV

Federation de International Football Association, FIFA

Gas Chromatography-Combustion-Isotope Ratio Mass Spectrometry, GC-C-IRMS

Hemoglobin, Hb

Hematocrit, Hct

International Association of Athletics Federation, IAAF

International Olympic Committee, IOC

Red Blood Cell, RBC

Standard Deviation, SD

Testosterone/Epitestosterone, T/E

Union Cycliste Internationale, UCI

United States, US

United States Olympic Committee, USOC

Maximal oxygen uptake, VO<sub>2</sub>MAX

World Anti-Doping Association, WADA

\*There are more abbreviations in the text. Each is specified when it first appears.

## Chapter 1. Technomedical Productions of Gender, Sports, Fairness and Doping.

*The practice of sport is a human right. Every individual must have the possibility of practicing sport, without discrimination of any kind and in the Olympic spirit, which requires mutual understanding with a spirit of friendship, solidarity and fair play. The organisation, administration and management of sport must be controlled by independent sports organisations.<sup>1</sup> The Olympic Charter, July 7, 2007.*

*Sexual differences are both the input and the output of the technological production of gendered bodies.<sup>2</sup> Anne Balsamo, 1997.*

What *genders* do modern doping debates produce? Doping debates consist of contests over what constitutes “doping,” the moral implications of “doping,” and technomedicine that informs this modern form of “doping.”<sup>3</sup> This technomedicine encompasses the highly technical and scientific medical practices produced by doping and anti-doping researchers. The doping debates exist across the multiple arenas of sports science and medicine, anti-doping research, and anti-doping policy. From within these arenas, technomedical researchers produce multiple gendered and racialized categories to judge athletes and the performance enhancements they use. These categories and judgements exceed the doping the debates.

This research is personal, as I have witnessed the tensions around gender and doping transgressions firsthand. I remember lining up at the beginning of the biggest one day race for female cyclists in the United States and hearing two fellow female racers question the gender and moral integrity of another racer. They suggested that the other racer had “man-arms” and then proceeded to question whether she doped. This was not the only time I witnessed such accusations of gender and doping

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<sup>1</sup> International Olympic Committee, "The Olympic Charter," (Lausanne, Switzerland 2007).

<sup>2</sup> Anne Balsamo, *Technologies of the Gendered Body: Reading Cyborg Women* (Durham: Duke University Press, 1997).

<sup>3</sup> Daniel M. Rosen, *Dope: A History of Performance Enhancement in Sports from the Nineteenth Century to Today* (Ann Arbor: University of Michigan Press, 2008). Rosen provides a nice summary of “firsts” with regard to doping. Within this summary, he also tells the classic tale of 1998. Garry Whannel, *Culture, Politics, and Sports: Blowing the Whistle, Revisited.*, ed. Jennifer Hargreaves and Ian McDonald, Routledge Critical Studies in Sport (London and New York, NY: Routledge, 2008). Whannel also retells the story in his work. 1998 was a pivotal year in the doping debates. Rosen notes that this was the first multi-stakeholder conference on anti-doping spearheaded by the International Olympic Commission (IOC). From this conference a new worldwide anti-doping regulatory body was produced---the World Anti-Doping Agency (WADA). Unlike previous anti-doping conferences, this conference included representatives from multiple arenas of the doping debates---Olympic insiders, policy makers, athletes, sports historians, pharmaceutical suppliers, providers, and scientists, and medical practitioners. At Lausanne the multiple stakes and sites of contestation within the doping debates became more visible.



transgressions. Over the years I have heard teammates, friends, and other competitors express similar concerns, usually about strong female racers. These concerns illustrate some of the social judgements about gender transgressive female athletes despite the dominant masculine culture of sports. This culture often values masculinity and masculine bodies as bodies best suited for athletics; yet, female athletes who develop more masculine bodies are subjected to accusations of transgression and cheating. Further, for gender transgressive female athletes the technomedical categories produced by the doping debates also judge them as potential dopers. Here the tensions between ideals of fairness and ideals of the practice of sport as a human right seem so palpable. As the media and their peers question these athletes' "true" gender (read: biological sex category), gender transgressive female athletes are subjected to technomedical researchers probing their hormone levels, genitalia, and chromosomal make-up for sex verification and doping detection.<sup>4</sup>

Although my questions derive from witnessed experiences, these have not been my own experience as an athlete. I have never stood accused of such gender and doping transgressions. This is likely related to my physical appearance, and, as such, my relation to the dominant masculine culture of sports. My appearance does little to disrupt dominant ideals of masculinity and femininity in sports, even when I am physically overexerting myself; I am a petite blond white woman. Hence, I am culturally privileged to possess an appropriate form of physical femininity. This is not to say that all women accused of doping or gender transgressions have physiques that disrupt the dominant cultural ideals; rather, I want to show my position and bring attention to the roles of privilege and power within the dominant culture of sports. This masculine dominant culture often privileges athletes who do not transgress gender norms.

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<sup>4</sup> Buisse Jo Ann M. and Melissa Sheridan Embser-Herbert, "Constructions of Gender in Sport: An Analysis of Intercollegiate Media Guide Cover Photographs," *Gender and Society* 18, no. 1 (2004). Buisse and Embser-Herbert provide a critical deconstruction of media representation and gender in sport in their article. Although, I do not delve into media representations and visual culture both my own account and Semenya's story also show how cultural gender values shape these representations and their interpretations. Initially, these accusations often begin with visual inspection by other competitors, spectators, the media, and various sports event watchers. This signals the importance of visual representation in our larger culture.<sup>4</sup> In the following, the focus will be on the often non-visual technomedical productions of gender and sex.

I turn to the story of Caster Semenya to further illustrate how such power is articulated on gender transgressive female bodies. A few years ago speculation about gender transgression began for the elite runner Caster Semenya---what an amazing athlete, 800 meters in 1:55:45 at 18 years old. When I think of her I can imagine the feeling of the crowd, the pounding of her heart, thoughts racing through her head too fast to hang on to and then the gun. Suddenly, legs pounding the ground and a unique silence---the kind that only happens for runners when the crowd roars. Caster pulls ahead of the other runners, beating them by over two-seconds. No doubt she felt overjoyed. However, it was short-lived. Soon the *IAAF officials*<sup>5</sup> would come and she would hear the Italian's comments, "Just look at her," or perhaps, even the Russian's comments, "she's a man." Caster would have to undergo sexual verification, again.<sup>6</sup> This time unlike the previous times she would be tested by a battery of scientists---all the way down to her genetic make-up and hormonal levels. It would not just be a visual inspection.<sup>7</sup> How frustrating it must have felt to be told not to show up to the medal ceremony.

Soon a story broke that IAAF officials were testing Semenya's testosterone to epitestosterone (T/E) ratio rather than verifying her sex.<sup>8</sup> These stories claimed her sex had been verified previously. Supposedly, this time she underwent routine doping tests that revealed a non-routine result, a T/E ratio three times higher than normal for females. In a sense, this story attempted to quell fears of gender transgressions with possible doping violations, and, it blurred the boundaries between gender and moral

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<sup>5</sup> Christopher Clarey and Gina Kolata, "Gold Awarded Amid Dispute over Runner's Sex," *The New York Times*, August 21, 2009.

<sup>6</sup> The International Association of Athletics Federations, IAAF, refers to this verification process as gender verification. While I find this very ironic, I have chosen to refer to it as sex or sexual verification because the tests involve verification of binary biological sex categories by technomedical analyses. This, of course, is not to suggest that these analytical frames are not part of the cultural distinction between masculine and feminine. Rather, I hope to draw attention to how the technomedical knowledge and practices are used to figure Caster Semenya's sex and gender and the contrast between this and the non-technomedical assessments she has received.

<sup>7</sup> Christopher Clarey, "Gender Test after a Gold-Medal Finish," in *The New York Times* (New York: The New York Times Company, 2009), Michael Kimmel, "The Bigotry of the Binary: The Case of Caster Semenya," in *The Huffington Post* (Huffington Post.com, Inc., 2009).

<sup>8</sup> "Caster Semenya Testosterone Levels within Normal Range--Report," *The Guardian*, August 28 2009. Virginia Wheeler and Harry Haydon, "We'll Go to War over Caster," *The Sun*, September 11, 2009. Since this story broke it has been confirmed that Caster Semenya was undergoing "gender verification" and that she possesses internal testes and does not possess ovaries. As of September 14, 2009, she has been classified as intersexed by the technomedical professionals working with the IAAF. It should be noted that this technomedical group includes a "gender expert."

transgressions for this strong female athlete. However, this was not the case, Caster Semenya underwent more extant sex verifications than before. Subsequently, she was barred from competition for almost a year while she underwent medical treatment for being intersexed.<sup>9</sup>

Situated as they are between concerns over gender and doping, Caster Semenya's stories are integral to making sense of the doping debates. Caster Semenya defies easy categorization by some standards and simultaneously represents many of the fears that lurk in anti-doping policy. How do we regulate (extra) ordinary athlete bodies? Caster Semenya as a potentially intersexed athlete represents one of the extremes in the world of sports and anti-doping policy---either a "natural" doper or a completely "unnatural" athlete---who neither fits neatly into the biological category of male or female nor corresponds to Western conceptions of a womanly bodily form.

Within the Olympic movement, female athletes have been subjected to sexual verification processes while no male athletes have had to undergo this process or stood accused of being women. The Olympics and Olympic sports exist as a space where male athletes and dominant masculinities become the norm while female athletes performing masculinity become suspect, as highlighted by the Semenya case and my own story.<sup>10</sup> The Olympic sense of fairness in this instantiation becomes a strategy for rendering female athletes simultaneously pathological and in need of protection from would-be intersexed athletes and dopers.<sup>11</sup>

Meanwhile, male athletes who perform gender within hypermasculine norms are often shielded from accusations of doping---Tyler Hamilton and Floyd Landis. Both men exhibited forms of hypermasculinity while riding the Tour de France. Hamilton rode the Tour de France with a broken

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<sup>9</sup> Simon Hart, "Caster Semenya Given All Clear after Gender Test Row.," *The Telegraph*, July 6 2010.

<sup>10</sup> Butler, *Gender Trouble: Feminism and the Subversion of Identity*. Jim McKay, Michael Messner, and Don Sabo, *Masculinities, Gender Relations, and Sport*, ed. Michael Kimmel, Research on Men and Masculinities Series (Thousand Oaks: Sage Publications, Inc. , 2000).

<sup>11</sup> Emily Martin, *The Woman in the Body: A Cultural Analysis of Reproduction* (Boston: Beacon Press, 1987). Martin draws attention to the ways in which women, menstruation, menopause and premenstrual syndrome have become pathological, 105-112, 125-126, and 166-172. While in Martin's case this pathology arises out of a particular early capitalist moment, I would like to argue that the discourses of pathology have remained in tact with women's bodies but the instants of emergence have shifted. I also think Foucault's notion of normalization and the creation and regulation of the abnormal works to explain the unique position of female athletes. The male athletic body continues to be the normal body of sports by which other bodies are judged.

collarbone and was able to capture a stage victory, while Landis suffered from near exhaustion only to come back and claim a stage and eventually the race. Yet, both athletes remained ambiguous in terms of doping through these performances. They both contested their positive doping results in court---while many fans, friends and others supported them---only to later admit doping.

Together these stories also make visible the intersections of race and gender, especially for Olympic and elite level athletes. Semenya as a black South African disrupts dominant forms of femininity for female athletes while Hamilton and Landis exemplify dominant forms of hypermasculinity in their sport. E. Francis White argues that the biological categories of race emerged in the nineteenth century with gender analogies and this created a type of scientific intersectionality for black women.<sup>12</sup> This intersectionality places all women as other to men but also positions women of color as other to white women. For White, black women and women of color, like Caster Semenya, can never fit neatly into the biological category of “female.” Such an intersectionality continues to exist, and technomedical researchers within the doping debates continue to privilege white bodies and white male bodies.

In the following, I show that technomedical researchers actively (re)produced binary sex/gender categories from a multiplicity of genders within anti-doping and doping technomedical practices. These reproductions were often racialized and sustained dominant race relations. I explore this aspect of the reproduction to a lesser extent than the gender aspect. However, this does not mean it is less important or less present. I make the binary sex/gender production process visible in order to make available less tenuous positions for those who do not fit neatly into the binary categories produced. Along with exploring the technomedical knowledge production process, my dissertation also traces ethical negotiation across different spaces. This emerges out of my conception of the technomedical as also constituting the technomoral in the cases of doping and anti-doping technologies.<sup>13</sup> Technomoral marks

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<sup>12</sup> E. Frances White, *Dark Continent of Our Bodies: Black Feminism and the Politics of Respectability* (Philadelphia: Temple University Press, 2001), 17, 81-88, 114.

<sup>13</sup> Paul Dimeo, *A History of Drug Use in Sport 1876-1976: Beyond Good and Evil* (New York: Routledge, 2007). Dimeo also recognizes the co-production of the sciences of doping and anti-doping with morality. Likewise, he acknowledges that different ethics are deployed around doping and anti-doping in differing contexts. His chapter 7 explains how science, morality and policy converge to “modernize the anti-doping

how technomedical knowledge practices simultaneously produce (principles of) right and wrong behavior with categories of people. This technomorality emerges out of the ethical frames, “ethics,” used by these researchers. Both ethical frames and “ethics” signal the principles and values that these researchers use to guide and justify their research. I ask throughout the dissertation what ethical frames are deployed for who around doping and anti-doping? This question draws attention to the ethical tension that exists from our current perspective to that of these researchers. For us, their experiments often seem ethically dubious, after all they were often either seeking to enhance athletic performance or administering known performance enhancers with potential health risks to their subjects to find better means of catching would-be cheaters. However, they performed legitimate scientific research and these ethical negotiations made it possible for the technomedical researchers to produce and reproduce the binary gender categories within sports.

Hence, these technomedical researchers often shift from a sports ethical frame to either an athletic performance research ethical frame or an anti-doping research ethical frame. The first ethical frame is premised on notions of “fair play” in sports while the second is guided by technomedical uncertainties regarding athletic performance and doping practices. The third ethical frame aims to produce “fair play” amongst competitors through the development of technomedical detection techniques that either catch or deter cheating athletes. How do these ethical frames work in conjunction with the technomedical knowledge practices to render normative, gendered, and racialized categories? Again, in the broadest sense, I ask: What *genders* do the modern doping and anti-doping practices produce?

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strategy (105).” To me, Dimeo does not deeply deconstruct the science of either doping or anti-doping detection efforts and he does not deal with way these convergences produce lived categories for athletes and non-athletes. Further, the co-production of gender and morality with the technomedicine of doping and anti-doping do not enter Dimeo’s argument.

### *A Brief History of Doping and Anti-Doping.*

Human athletes, the Olympic Games, and performance enhancing substances share a long history. Ancient Greek Olympians ate special meals and took special potions in preparation for the Games.<sup>14</sup> Using the term doping, however, is relatively recent. The World Anti-Doping Agency (WADA) suggests that the word doping derives from the Dutch word, dop, “the name of an alcoholic beverage made of grape skins used by Zulu warriors to enhance their prowess in battle.”<sup>15</sup> Other scholars, like Daniel Rosen, also link the term to this usage and they further link the term’s origins to the early twentieth century and horse racing.<sup>16</sup> Rosen contends dope was also used “to describe the act of giving racehorses illegal medications or substances, with the idea of changing (either improving or diminishing, depending on the doper’s intention) the way the horse performed.”<sup>17</sup> While the term’s origins are disputed, Rosen marks an important distinction between the current (or modern) era and previous eras of performance enhancing substances. The current era involves technomedically developed substances and practices.<sup>18</sup> My story revolves around this technomedical development, its relation to human performance, and its regulation.

During the 1920s, the International Amateur Athletic Foundation (IAAF) banned the use of stimulating substances, i.e. amphetamines, and with this introduced the first doping ban.<sup>19</sup> Other sports governing bodies followed suite and banned stimulant use. As time progressed more medical substances entered sports as performance enhancers.

Researchers produced the first synthetic hormones in the 1930s. These included synthetic anabolic androgenic steroids. The North American story often told about the entrance of these performance enhancers into their sports suggests that an American doctor working with the Olympic

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<sup>14</sup> World Anti-Doping Agency, "A Brief History of Doping," World Anti-Doping Agency, <http://www.wada-ama.org/en/dynamic.ch2?pageCategory.id=312>.

<sup>15</sup> World Anti-Doping Agency, "A Brief History of Doping," World Anti-Doping Agency, <http://www.wada-ama.org/en/dynamic.ch2?pageCategory.id=312>.

<sup>16</sup> Daniel M. Rosen, *Dope: A History of Performance Enhancement in Sports from the Nineteenth Century to Today* (Ann Arbor: University of Michigan Press, 2008).

<sup>17</sup> *Ibid.*, iix.

<sup>18</sup> Rosen also marks a distinction between the early “modern” era and the current “modern” era. In the early era the doper was not the athlete, rather, it was the person administering the substance. Now, the athlete is assumed to be the one administering the substance and carries the moral burden of doping.

<sup>19</sup> World Anti-Doping Agency, "A Brief History of Doping," World Anti-Doping Agency, <http://www.wada-ama.org/en/dynamic.ch2?pageCategory.id=312>.

weight lifting team learned of anabolic androgenic steroid use from his Russian counterpart over drinks. However, Charles Yesalis and his colleagues trace the origins of anabolic androgenic steroid use in US to bodybuilders during the 1940s.<sup>20</sup> Regardless of the origins of anabolic androgenic steroid use in the United States most scholars agree that they seem to have permeated from strength-based sports to other sports during the 1960s and 1970s.

These anabolic androgenic steroids represented a new type of performance enhancement from previous types. They were taken well before events to produce lasting strength effects for the athletes. Anabolic androgenic steroids were process oriented performance enhancers, meaning an athlete had to take them while they trained to gain their performance enhancing effects. Additionally, these steroids aided in recovery from events. Athletes previously took performance enhancing drugs for short-term during competition gains. These previous enhancement substance types included narcotics, stimulants, pain relievers, MAO-I inhibitors and tranquilizers.<sup>21</sup> Throughout the 1960s and 1970s athletes used a range of performance enhancements from both this new type and the old.

The International Olympic Commission (IOC) implemented the first Olympic drug tests at the 1968 Games.<sup>22</sup> These tests came in the wake of a Danish cyclist's death at the Rome Olympics.<sup>23</sup> Knud Enemark Jensen died after falling during the 100 kilometer time trial while on stimulants.<sup>24</sup> Professor Arnold Beckett developed these initial tests and piloted them at the Tour of Britain (a Union Cycliste

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<sup>20</sup> Charles E. Yesalis et al., "Incidence of Nonmedical Use of Anabolic-Androgenic Steroids," in *Anabolic Steroid Abuse*, ed. Lynda Erinoff Geraline C. Lin (Rockville, MD: United States Department of Health and Human Services, 1990), 97. In this book chapter, Yesalis provides a chronology of testosterone and anabolic androgenic steroid use and regulation. He also advocates for more research into anabolic steroid use to combat the health problems associated with their use.

<sup>21</sup> Daniel M. Rosen, *Dope: A History of Performance Enhancement in Sports from the Nineteenth Century to Today* (Ann Arbor: University of Michigan Press, 2008), 35. Melvin H. Williams, *Drugs and Athletic Performance* (Springfield: Charles C. Thomas, 1974). In this book Dr. Williams both classifies the major drugs used by athletes at the time and gives what he believes the rationale for their prohibition in sports. Among the drugs he lists and provides a rationale for are major tranquilizers which he says are likely banned because they would relieve pre-competition nervousness for athletes. This could result in performance enhancement.

<sup>22</sup> World Anti-Doping Agency, "A Brief History of Doping," World Anti-Doping Agency, <http://www.wada-ama.org/en/dynamic.ch2?pageCategory.id=312>.

<sup>23</sup> Rosen, *Dope: A History of Performance Enhancement in Sports from the Nineteenth Century to Today*, 22.

<sup>24</sup> *Ibid.*, 22. Rosen states that Jensen's autopsy may have contained evidence of amphetamine use, nicotinal alcohol use, and ronicol (another stimulant) use.

Internationale, UCI, event) and the London World Cup (a Federation Internationale de Football Association, FIFA, event) in 1966.<sup>25</sup>

Beckett had initially developed this technique to better understand drug metabolism.<sup>26</sup> He presented his work at a research symposium on medicinal chemistry where a Belgian anti-doping researcher cued into its use to detect athlete's drug use.<sup>27</sup> These drug tests were designed to catch athletes using amphetamines and other drugs that were foreign to the athlete's body. These initial attempts to detect stimulants and trace amounts of other foreign drugs relied on the use of gas chromatography-mass spectrometry (GC-MS) to analyze the urine of athletes. The technomedical method allowed researchers to distinguish between naturally occurring chemicals and synthetic stimulants in urine and it marked the "modern" period of doping and anti-doping.<sup>28</sup> That is it marked the beginning of the period in which science, morality, and policy converge.<sup>29</sup> This method primarily detected the "old" type of performance enhancers.

In 1974, Beckett sought the help of fellow London researcher Professor Raymond Brooks in developing a test for anabolic androgenic steroid detection.<sup>30</sup> Brooks' method relied on radioimmunoassay (RIA) techniques and was later replaced by a GC-MS method.<sup>31</sup> West German researchers also worked on developing a technique to detect anabolic androgenic steroids at this time. They perfected a GC-MS method. With the GC-MS method in place, the IOC both banned anabolic androgenic steroid use and began testing athletes' urine for their presence.

Thomas Hunt provides a detailed analysis and chronology of doping and doping policy during the 1970s in his article entitled "Sports, Drugs, and the Cold War: The Conundrum of Olympic Doping

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<sup>25</sup> Dimeo, *A History of Drug Use in Sport 1876-1976: Beyond Good and Evil.*, 14, 106-107.

<sup>26</sup> King's College, "Arnold Beckett: Novel Methods in Pharmacology," King's College, <http://www.kcl.ac.uk/biohealth/research/divisions/aes/about/history.aspx>.

<sup>27</sup> Dimeo, *A History of Drug Use in Sport 1876-1976: Beyond Good and Evil.*, 106.

<sup>28</sup> Ivan Waddington, *Sport, Health and Drugs: A Critical Sociological Perspective* (London: E & FN Spon, 2000), 96-97., Rosen, *Dope: A History of Performance Enhancement in Sports from the Nineteenth Century to Today.*, vii., Dimeo, *A History of Drug Use in Sport 1876-1976: Beyond Good and Evil.*, 13, 87.

<sup>29</sup> Thomas Hunt, Paul Dimeo, and Scott Jedlicka, "The Historical Roots of Today's Problems: A Critical Approach of the International Anti-Doping Movement," *Performance Enhancement & Health* 1(2012).

<sup>30</sup> *Ibid.*, 112.

<sup>31</sup> *Ibid.*, 112.



Policy, 1970-1979.”<sup>32</sup> In this analysis, Hunt explains that during the 1970s the IOC attempted to regulate doping, however, these attempts were often undermined at or below the national level of sports governing bodies in attempt to pursue nationalistic gains in the medals race. For Hunt, the 1970s’ doping policy was marked by ineffective testing and inconsistent policy enforcement which allowed athletes, coaches, and officials to take advantage of doping policy loopholes. These loopholes included athletes using anabolic steroids until about one month before competition and testing periods. Further, athletes replaced the synthetic anabolics with testosterone through competition and testing periods as testosterone was neither explicitly banned nor was it detectable.<sup>33</sup> Alongside the doping concerns of the 1970s the IOC also implemented sex verification testing for female athletes. These tests verified sex at the chromosomal level rather than at the somatic or psychosocial levels.<sup>34</sup> These sex verification tests drew on technomedical means of verification akin to those used by anti-doping researchers. Hence, the 1970s was a period marked by concerns about what was going into athletes’ bodies and what constituted (female) athlete bodies.

Athletes turned more towards testosterone during the late 1970s as testing for anabolic androgenic steroids became more effective.<sup>35</sup> Manfred Donike found a way to detect testosterone use in

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<sup>32</sup> Thomas Hunt, "Sports, Drugs, and the Cold War: The Conundrum of Olympic Doping Policy, 1970-1979.," *Olympika* XVI, no. 2007 (2007). Hunt also points to the state-sponsored nature of doping during the 1970s. While he does not claim that Western governments undertook such experimentation, he does point out that they were often complicit when individual researchers in their countries did so. Hunt sees the Cold War period as a boom period for drug use in sports.

<sup>33</sup> John Hoberman, *Testosterone Dreams: Rejuvenation, Aphrodisia, Doping*. (Los Angeles, CA: University of California Press, 2005)., 177, 182. Hoberman presents the “history of the synthetic hormone testosterone and the careers it has made (1)” in this book. In Chapters 5 through 7, he examines the roles of testosterone in Olympic sports. John Hoberman asserts that “anabolic androgenic steroids...transformed modern feelings about the doping of elite athletes” for these hormones granted ordinary people physiological status akin to athletes. He sees the anti-doping campaign as one that is subverted by simultaneous demands for higher performance and self-restraint (181). And, Hoberman argues for more critical examination of the role played by physicians in doping with hormones (190). Hoberman critically analyses testosterone and anabolic steroids use in sport without much regard for the actual technologies that make their doping detection possible.

<sup>34</sup> Hunt, "Sports, Drugs, and the Cold War: The Conundrum of Olympic Doping Policy, 1970-1979.," 23

<sup>35</sup> Terry Todd, "Anabolic Steroids: The Gremlins of Sport," *Journal of Sport History* 14, no. 1 (1987)., 98. Todd provides a good early chronology of anabolic androgenic steroid use in sport especially in the United States. He also chronicles the introduction of testing and provides some counter-arguments to other scholars claims about the tactic complicity of anti-doping efforts and sportive nationalism.

1982 after performing post-hoc tests on the urine samples from the Moscow Olympic games.<sup>36</sup>

Testosterone differed from the previous anabolic androgenic steroids in that athletes naturally produced testosterone. This complicated detection even though the testosterone used by athletes for performance enhancement was not their own. Rather, athletes turned to synthetically produced testosterone to increase their levels beyond those their bodies already produced. Many early detection techniques could not distinguish between athletes' testosterone and synthetically produced testosterone. The 1980s remained a period marked by athlete performance enhancement use despite the continued efforts to develop and refine detection techniques for an ever increasing range of such substances. Ben Johnson's positive doping detection result for stanozolol in 1988 made this particularly evident.<sup>37</sup>

By the mid-1980s the IOC had prohibited the use of testosterone, anabolic androgenic steroids, narcotics, stimulants and various other performance enhancing substances. However, the 1984 American Olympic cycling team admittedly used blood transfusion techniques and won nine medals.<sup>38</sup> Although rumors of "blood doping" had been circulating since the 1960s and 1970s, there had been little admission of its use until the 1980s. After the 1984 Olympics, the IOC banned its use despite not having a detection method for it.<sup>39</sup>

Blood doping would come to represent the "new" process oriented performance enhancement type. Blood doping required athletes to partake in the process during training to gain the maximal performance enhancing effects. However, blood doping, itself, also broke with other forms of performance enhancement in that it did not require any substances from outside of one's own body. Hence, this initial form of blood doping did not easily fit into the same category as other banned substances nor was it easily detectable.

Blood doping, anabolic androgenic steroids, and testosterone all shared a process orientation to performance enhancement; the "new" type of performance enhancers targeted long-term effects. Yet, the

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<sup>36</sup> Ibid., 99.

<sup>37</sup> World Anti-Doping Agency, "A Brief History of Doping," World Anti-Doping Agency, <http://www.wada-ama.org/en/dynamic.ch2?pageCategory.id=312>.

<sup>38</sup> S. Leigh-Smith, "Blood Boosting: Review," *British Journal of Sports Medicine* 38(2004), 99.

<sup>39</sup> Ibid.

long-term effects of blood doping differed from those of anabolic androgenic steroids and testosterone. Anabolic androgenic steroids and testosterone easily conformed to the dominant model of athletics which values physical attributes aligned with hypermasculinity, like bigger muscles and more “brute” strength. Blood doping, on the other hand, aligned with a different notion of athletic prowess. Athletes using blood doping were seeking to increase their endurance capacity.

Throughout the 1980s and 1990s anti-doping researchers continued to pursue detection refinements and new detection techniques. In 1998 another performance enhancement scandal erupted, the Festina affair.<sup>40</sup> A French cycling team’s masseur was arrested on his way to Ireland for the start of the Tour de France. In the team vehicle he was driving the police found 400 ampules of erythropoietin, EPO,<sup>41</sup> and 250 batches of steroids. At the team headquarters in Lyon eighteen further samples of prohibited performance enhancing substances were found. It seemed anti-doping efforts were neither deterring nor preventing athletes from using prohibited substances. Blood doping in this new form presented new challenges to detection while the challenge of detecting blood re-infusion also remained. During the late 1990s and early 2000s anti-doping researchers determined methods to detect EPO and like hormones, blood re-infusion continued to present detection difficulties. Much like testosterone the measurement of re-infusing one’s blood for detection purposes relied on models derived from population-based statistics. Detecting both blood doping and testosterone use remains difficult.

Testosterone and blood doping’s detection stories further converged over the course of the last five years as population-based statistics have increasingly been supplanted by individual-based statistics of biomarkers in blood and urine. These biomarkers are monitored for both endogenous hormone use and blood re-infusion use.<sup>42</sup> Anti-doping researchers initially expanded the “populations” used to assess athlete endogenous hormone or blood doping use. However, even after this expansion detection remained

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<sup>40</sup> Waddington, *Sport, Health and Drugs: A Critical Sociological Perspective.*, pp. 153-169.

<sup>41</sup> Erythropoietin is a hormone that prompts the body to generate more red blood cells. EPO is what may be thought of as a “second generation” of blood doping. Using EPO no longer required athletes to undergo blood removal and re-infusion to gain the benefits of excess red blood cells.

<sup>42</sup> World Anti-Doping Agency, "Athlete Biological Passport," World Anti-Doping Agency, <http://www.wada-ama.org/en/Science-Medicine/Athlete-Biological-Passport/>.

difficult. Hence, anti-doping researchers turned toward statistical modeling and monitoring based on individual athlete parameters in hopes of detecting excesses and anomalies associated with blood doping and endogenous hormone use.

These two divergent doping methods have become increasingly defined in similar terms by anti-doping researchers despite having different physiological effects on athletic performance. Their convergence and differences make for an interesting comparison. Specifically, testosterone and other anabolic endogenous hormones are understood as performance enhancing because they aid in the generation of “masculine” physical attributes. Blood doping, on the other hand, seems to generate a more “gender neutral” enhancement---increased endurance capacity through the availability of more red blood cells. Yet, doping and anti-doping researchers have worked to define both in masculine terms albeit in differing ways.

### ***Co-production<sup>43</sup> of Gender Technomoral Categories and Technomedical Practices.***

#### *Technomedical Knowledge Production: Doping and Anti-Doping Technologies.*

I explore the technomedical production of these doping and anti-doping technologies because few scholars have given this attention. Specifically, I take the technomedical to be similar to Adele Clarke’s technoscientific biomedicine. For me, technomedical signals the highly technical and scientific forms of medicine and medical knowledge produced by these researchers. In a sense, their work foreshadows Clarke’s proposed shift to the biomedical.<sup>44</sup> Rather than explore such broad cultural phenomena as Clarke does this dissertation explores the construction of specific technomedical and technomoral entities, blood doping and testosterone and endogenous steroid detection.

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<sup>43</sup> Whereas for many coproduction signals the joint knowledge and technology making of technical experts and various others, I have chosen to use the hyphenated form (co-production) to mark the joint production of technomedical knowledge and gendered, racialized, moralized categories by technomedical researchers.

<sup>44</sup> Adele Clarke et al., "Biomedicalization: Technoscientific Transformations of Health, Illness, and U.S. Biomedicine," *American Sociological Review* 68(2003).

To explore the technomedical production of blood doping technologies and testosterone and endogenous steroid detection technologies I also draw from the works of Michel Foucault, Lisa Jean Moore and Adele Clarke, Elizabeth Grosz and Anne Balsamo.<sup>45</sup> Foucault's normalization of populations has been described as "a process of moving the population toward norms or standards via disciplinary technologies, particularly in the areas of education, the military, public and mental health, criminality and sexuality."<sup>46</sup> I argue that blood doping technologies work to *ab-normalize* populations. In a process similar to Foucault's normalization, technomedical blood re-infusion researchers produce gendered, racialized norms in relation to their white male normal subject category. I use the term ab-normalize to draw attention to and address Foucault's inadequacy in dealing with gender, race, and other categories outside of the dominant norm. Normalization largely marks the norm and those outside of it remain unnamed and often un-normalized. Ab-normalization names these categories and draws attention to how these non-normal categories also undergo normalization or, rather, ab-normalization. For these categories, norms are set both in relation to the dominant norm and to other non-normal categories.

In unraveling the ab-normalization of athletes, it is key to remember that technomedical researchers construct "the body" as "natural." Lisa Jean Moore and Adele Clarke have argued that anatomists have "naturalized and normalized" the "body" through their knowledge making practices.<sup>47</sup> Doping and anti-doping technomedical researchers have participated in certain processes that produce both "normal" bodies and "natural" knowledge about bodies, i.e. naturalization. Blood re-infusion and doping researchers add to this area of ab-normalized knowledge-making by constructing "normal" blood re-infusion and blood doping bodies, often as both "natural" bodily states and as potentially transgressive moral agents. Through testosterone and endogenous steroid detection technologies anti-doping

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<sup>45</sup> David. Hess, *Science Studies: An Advanced Introduction* (New York: NYU Press 1997)., Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Random House, 1977)., Lisa Jean Moore and Adele Clarke, "Clitoral Conventions: 20th Century Anatomy Texts," *Feminist Studies* 22, no. 1 (1995)., Elizabeth Grosz, *Volatile Bodies: Toward a Corporeal Feminism* (Bloomington: Indiana University Press, 1994). Anne Balsamo, *Technologies of the Gendered Body: Reading Cyborg Women* (Durham: Duke University Press, 1997).

<sup>46</sup> Hess, *Science Studies: An Advanced Introduction*., 117-118.

<sup>47</sup> Moore and Clarke, "Clitoral Conventions: 20th Century Anatomy Texts.", 257.

researchers also participate in ab-normalization and naturalization processes. Specifically, they create many different forms of authentic hormonal gender types. These authentic hormonal gender types represent the technomedically legitimate, either normal or non-normal “natural,” types of gender available to athletes.

From these ab-normalizations, these researchers also define a range of transgressive types. These types often align with Balsamo’s transgressive bodies. Anne Balsamo describes transgressive bodies, like female body builders, as those who transgress gender boundaries, yet cultural processes maintain the subjection of these bodies.<sup>48</sup> For Balsamo this subjection entails how these bodies are persistently arranged within gender and race hierarchies “to keep each body in its place---that is subjected to its other.”<sup>49</sup> She goes on to claim that the other for white women is the “idealized ‘strong’ male body;” and, for black women the other is the “white female body.”<sup>50</sup> She suggests that female athletes who use technology to achieve muscularity transgress the naturalized order of gender identity within our culture.<sup>51</sup> I argue that in addition to producing gender transgressive types like Balsamo’s, these researchers also defined moral transgressive types and bond the two forms of transgression together through their ab-normalizations.

By looking at blood doping and endogenous steroid detection, both categories of moral and technological transgression, I hope to offer a different account of transgression that sees masculinity and femininity constructed in a multitude of different arrangements. The transgressions of female endurance athletes differ from those of bodybuilders. Elite endurance athletes do not become transgressive by increasing their muscle-bound physiques. They become transgressive when they are able to “unnaturally” or “non-normally” increase their ability to endure. Likewise, ab-normal testosterone and hormonal excretion does not render either male or female athletes transgressive alone. Rather, a series of authentic

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<sup>48</sup> Balsamo, *Technologies of the Gendered Body: Reading Cyborg Women*, 55.

<sup>49</sup> *Ibid.*, 55.

<sup>50</sup> *Ibid.*, 55.

<sup>51</sup> *Ibid.*, 43.

masculinities and genders are produced through these technologies that render a range of non-transgressive and transgressive technomoral positions available to athletes.

*Sport Technologies as Sites of Ethical Negotiation.*

Along with exploring the process of technomedical knowledge production, my dissertation also traces ethical negotiation across different spaces. Technomoral and technomedical knowledge production intersect where doping and anti-doping researchers shift ethical frames from sport oriented frames to research oriented frames as they produce sport technologies. These shifting ethical frames include shifts from the ethics of sport to the ethics of human performance research and anti-doping research. Each of these is laden with its own set of assumptions about morality. However, at their intersections these ethical frames undergo negotiation and potentially subvert their assumed moralities.

Previous research on the ethical frames of doping and anti-doping technologies has left intact these assumed moralities or unquestioningly imposed their own moralities. In 1997, Werner Franke and Brigitte Berendonk published an article in *Clinical Chemistry* that gave an account of the German Democratic Republic's athlete doping research program.<sup>52</sup> This secret state-sponsored steroid doping research program of the GDR focused on female athletes. For Franke and Berendonk this research represents unethical research because it was done in secret, broke the rules of sport, and was intentionally undertaken to enhance performance. While Franke and Berendonk do not castigate these researchers for having lower ethical standards than their Western counterparts, they do present GDR researchers as having crossed another ethical barrier that presumably Western researchers would not when they administered androgens to female athletes in the 1960s.<sup>53</sup> While I disagree with the notion that administering androgens or any performance enhancers to female athletes presents a new ethical barrier distinct from that of administering the same substances to male athletes, Franke and Berendonk's work

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<sup>52</sup> W. Franke and B. Berendonk, "Hormonal Doping and Androgenisation of Athletes: A Secret Program of the German Democratic Republic Government," *Clinical Chemistry* 43(1997).

<sup>53</sup> *Ibid.*, 1264.

signals a larger cultural ethical frame about the “inherent” distinctions between males and females and subsequently male and female athletes. Although they do not explicitly state it, Franke and Berendonk make it apparent that this larger cultural frame informs the ethics of technoscientific research particularly as related to doping research.

Michael Kalinski, the former chair of the Exercise Biochemistry Department in Kiev, gazes into Soviet creatine and blood doping programs during the Cold War in his article, “State-Sponsored Research on Creatine Supplements and Blood Doping in Elite Soviet Sport.”<sup>54</sup> Kalinski tells the story of how these doping techniques were pursued to attain athletic dominance in their respective sports. Kalinski states that blood doping was widely practiced by Soviet athletes by the 1970s.<sup>55</sup> Similar to Franke and Berendonk, Kalinski presents this research as “abusive” because it was practiced and developed in secret.<sup>56</sup> Further, Kalinski states that the research and use of blood doping was unethical because Soviet researchers were risking the lives of their athletes due to possible health complications from the increased amount of circulating red blood cells.<sup>57</sup> Importantly, Kalinski, Franke and Berendonk realize that there is overlap between the ethical frame of sports and the ethical frames of doping researchers, although, they do not make sense of these ethical frames as co-produced.

John Hoberman provides a history of synthetic testosterone in *Testosterone Dreams*.<sup>58</sup> In part, he follows the role of testosterone in Olympic sport. Hoberman links testosterone’s role to the role of sport physicians. He suggests these doctors sit at an ethical crossroads between therapeutic use and experimental use. At this crossroads doctor-athlete doping collaborations are less contentious as these doctors see themselves as healing their patients. Hoberman argues that this ethical space, combined with ambivalent public attitudes towards doping and a regulatory mismatch between anti-doping policy and action, lends to the historical reality of doped Olympians and elite athletes. Within this space, testosterone

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<sup>54</sup> Michael Kalinski, "State-Sponsored Research on Creatine Supplements and Blood Doping in Elite Soviet Sports," *Perspectives in Biology and Medicine* 46, no. 3 (2003).

<sup>55</sup> *Ibid.*, 448.

<sup>56</sup> *Ibid.*, 445.

<sup>57</sup> *Ibid.*, 449.

<sup>58</sup> Hoberman, *Testosterone Dreams: Rejuvenation, Aphrodisia, Doping*.



use can be embraced for its performance enhancing features. Hoberman shows the ethical negotiation at the doctor-athlete crossroads in his work. My work differs from his in my focus on ethical negotiation among researchers who developed the actual doping and anti-doping technologies rather than administering physicians.

Paul Dimeo also provides insight into the various ethical spaces and frames of anti-doping. He contends that we must look beyond the assumed “good” of anti-doping campaigners and “evil” of drug users to make sense of the social arrangements that constitute this good and evil.<sup>59</sup> For Dimeo, a “Eurocentric, pseudo-religious morality linked with a romantic idealism about the function of sport in society” rendered this good and evil.<sup>60</sup> Dimeo’s account of the pre-World War II era of the doping sciences combined with his deconstructivist approach, provide a nice backdrop to my case studies. The first part of Dimeo’s book focuses on the doping sciences from the 1870s to WWII; he suggests that before WWII the dominant view of athletes’ drug use was one where drugs enabled athletes to perform as “pinnacles of human achievement.”<sup>61</sup>

Social forces, largely outside of the doping sciences, rendered these drugs more morally ambivalent over time. Dimeo locates the “doping crisis” as burgeoning from both increased drug use in sports and what he calls “the emergence and consolidation of anti-doping.”<sup>62</sup> For Dimeo this anti-doping came as policy created by zealous medical professionals within the IOC. From here the problem of anti-doping was turned over to scientists who would attempt to develop better detection methods to solve the problem.<sup>63</sup> While Dimeo recognizes anti-doping policy’s proposed solution and definition as scientific he does little in the way of deconstructing the science of either. I shift the focus to look at how specific cases of doping and anti-doping technomedicine produce technomoral categories for athletes. I examine how these technomoral categories emerged within the technomedical arena, not as ideals separate from the technomedical arena.

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<sup>59</sup> Dimeo, *A History of Drug Use in Sport 1876-1976: Beyond Good and Evil*, 6.

<sup>60</sup> *Ibid.*, 6.

<sup>61</sup> *Ibid.*, 9.

<sup>62</sup> *Ibid.*, 9.

<sup>63</sup> *Ibid.*, 103.

***Structure and Subversion: Performative Gendered Technomoral Categories.***

The gendered (often racialized) technomoral categories co-produced through sports technomedicine exist as active categories. These performative categories---”manufactured through a set of sustained set of acts, posited through the gendered body”<sup>64</sup>---shift as the acts sustaining them change. These categories simultaneously reproduce and subvert the dominant gender and racial power relations.

The dominant gender power relations align with the binary sex/gender separation of most Olympic sports. This separation, largely premised on naturalized essentialist notions of sex and gender, often goes unquestioned by sports governing bodies, like the International Olympic Committee (IOC), the International Association of Athletics Federations (IAAF), the Fédération Internationale de Football Association (FIFA), and the Union Cycliste Internationale (UCI). Many such sports governing bodies problematically present this separation as a solution to gender inequity in sport. Yet, as Joan Grassbaugh Forry observes “sport continues to be a site where ideological beliefs about gender are deeply entrenched, specifically those regarding the inferiority of female athletes.”<sup>65</sup>

In the United States, Title IX represents the policy enactment of this gender and sex separation as a solution to gender inequities in sport. Title IX was passed in 1972. Through Title IX, much like Olympic events, many federally funded educational sports programs have sought gender equality through structuring sex and gender separated sports programs. We see in the wake of Title IX many more girls and women playing school sports.<sup>66</sup> Yet, many scholars have critiqued Title IX and its sex segregated structure for perpetuating the very inequities it seeks to undermine. In a book review Joan Grassbaugh

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<sup>64</sup> Judith Butler, *Gender Trouble: Feminism and the Subversion of Identity*, ed. Linda Nicholson, 2 ed., Thinking Gender (New York: Routledge, 1999), xv.

<sup>65</sup> Joan Grassbaugh Forry, "Out of Play: Critical Essays on Gender and Sport/Equal Play: Title IX and Social Change/Playing with the Boys: Why Separate Is Not Equal in Sports.," *Signs: Journal of Women in Culture and Society* 34, no. 3 (2009), 723.

<sup>66</sup> Iram Valentin, "Title IX: A Brief History," in *25 Years of Title IX Digest* (Newton, MA: Women's Educational Equity Act Resource Center, 1997), 5. Cassandra Jones, "Book Review: Getting in the Game: Title IX and the Women's Sport Revolution," *Marquette Sports Law Review* 22, no. 2 (2012), 613. These figures range from a four-fold increase at the Collegiate level in 1997 to a ten-fold increase at the high school level in 2012.

Forry astutely points out that sport does not reflect inherent gender differences; rather, it often produces gender differences.<sup>67</sup> Further, she claims that historically sex segregation, like that found under Title IX, often supports dominant gender power relations rather than dismantling them.<sup>68</sup>

By shifting my attention away from the policies governing sex segregation to doping and anti-doping technomedical practices, I am able to show that through this form of technomoral policy the sex segregated structure remains intact while also being subverted. Initially, blood doping researchers determined the efficacy of the technique on male bodies and for male athletes. Then they turned to female bodies and female athletes. Adhering to the dominant gender power relations, they found females could also blood dope; however, females were unlikely to surpass blood doping males or male athletes. Likewise, initial testosterone detection techniques upheld the sex segregated structure and gender power relations. Yet, as time passed and new testosterone detection methods evolved, researchers made a range of hormonal gender types available to athletes so long as the athlete conformed to their biological sex category. Under this slightly subversive system female athletes and intersexed athletes, like Caster Semenya and the cyclist discussed in the introductory anecdote, still find themselves under constant suspicion of gender and doping transgressions for their masculine physiques and great athletic performances.

### ***Organization of the Dissertation***

Chapter 2 explores how “blood doping” emerged within sports medicine and physiology from the 1970s to the early 1980s. This emergence legitimated the claims of athletes and the anti-doping movement that adding more blood to (elite/Olympic) endurance athletes could serve as a performance enhancer. This legitimation marked these endurance athletes’ bodies as potentially transgressive while simultaneously normalizing and naturalizing the same bodies. Using an ethical frame of uncertainty around blood doping claims, American and Canadian researchers worked to determine an effective means

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<sup>67</sup> Forry, "Out of Play: Critical Essays on Gender and Sport/Equal Play: Title IX and Social Change/Playing with the Boys: Why Separate Is Not Equal in Sports.", 727.

<sup>68</sup> Ibid.

of blood doping. This ethical frame relied on the uncertainty surrounding blood doping as an effective ergogenic aid; that is uncertainty as to whether blood doping represented an unnatural aid that produced advantages beyond an athletes' biological potential. Through these uncertainties several researchers bypassed the anti-doping movements' larger ethical frame of fairness to research blood re-infusion and blood doping. Their research then moved blood doping from uncertain to certain through multiple normalizations---technical, subject, physiological---often on male bodies. In the process of these normalizations, researchers created multiple gendered moral categories related to "blood doping" and blood re-infusion. They simultaneously resolved the ethical frame of uncertainty and re-articulated an ethical frame of fairness that differentially positions the categories created through normalization.

The subsequent chapter traces the co-production of knowledge of female athlete bodies, blood transfusion for increasing the oxygen carrying capacity of these bodies, and categories relative to a particular technomedical morality. This particular technomedical morality, technomorality, cast female blood boosters as "ab-normal" from their "non-normal" male counterparts. While Chapter 2, also traces the co-production of gendered moral categories and blood doping, it focuses on the mostly male "normal" categories. Here I turn towards the simultaneous production of the normal, non-normal, and ab-normal. The normal category represents the non-deviant category while both non-normal and ab-normal mark deviant categories. The latter category is an illegitimate category of deviance and the former encompasses both desired deviant and expected deviant categories. I suggest that these categories are produced via "ab-normalization"---a term I use to refer to the technomedical creation of knowledge of bodies that are simultaneously normal, non-normal, and ab-normal. Like normalization, ab-normalization renders forms of deviance policeable by creating distinctions amongst these forms. In the case of female blood boosters and blood dopers, ab-normalization refers to *their* simultaneous normalization and construction as deviants from the male norm.

While Chapter 3 traces the ab-normalization of female blood re-infusion subjects that ultimately renders female blood doping athletes policeable, Chapter 4 turns to the technomedical detection of excess hormones. During the 1980s sports anti-doping researchers developed the initial processes for detecting

testosterone use by athletes. This chapter specifically looks at the use of gas chromatography-mass spectroscopy (GC-MS) and radioimmunoassay (RIA) as these techniques relate to the “testosterone to epitestosterone” (T/E) ratio that defined testosterone-doped athletes. These techniques shifted “authentic” masculinity from an aesthetic quality usually tethered to male bodies to a matter of hormonal composition in both male and female bodies. These researchers established a technical means of evaluating a moral characteristic---doping---as well as a technical moralization of gender. I call this authentication. Established through population-based steroid profiles, these techniques aligned with a hypermasculine model of athletes where both male and female athletes were permitted to have up to six times the “normal” amount of testosterone per biological sex category circulating through their bodies when tested.<sup>69</sup> These researchers defined athletes as a category of bodies capable of possessing more testosterone than the “normal” population. Yet, this non-normality had to be policed at the margins to protect the non-normal from the immoral. These researchers co-produced authentic forms of hormonal masculinity for male and female athletes with their technomedical detection techniques for distinguishing between “doped” and non-doped athletes. Their “authentications” exist as a means of regulating and policing the non-normal and ab-normal categories of athletes relative to endogenous steroids; “authentication” is my term for the ab-normalization process of these anti-doping researchers. Hence, throughout the remainder of the dissertation it will not appear in quotation marks.

The final case-based chapter examines how post-T/E ratio detection techniques co-evolved with new forms of authentic hormonal gender for athletes. The T/E ratio shifted from evidence of doping to a criterion for further testing in the 1990s. Through this shift anti-doping researchers shifted the terms for judging athletes’ hormonal and moral character. They began using gas chromatography-combustion-isotope radio mass spectrometry (GC-C-IRMS) and longitudinal studies of athletes’ excretion rates to monitor endogenous steroid use. Anti-doping researchers developed “normal” ranges for carbon isotope levels in individuals using GC-C-IRMS; and, they developed sub-population categories of “normal”

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<sup>69</sup> During this period, the T/E ratio measurement was used on athletes participating in elite national competitions, elite international competitions, and Olympic competitions. The International Olympic Committee initially adopted the T/E threshold than other sports governing bodies followed suit.

hormonal excretion rates using longitudinal studies. Authentic hormonal gender was transformed into the measurement of carbon isotope levels and multiple hormonal excretion rates. Again, policing authentic hormonal gender meant policing the non-normal and ab-normal athletes.

The conclusion presents my main arguments. Here I propose ways out of the binary sex system of sports based on my findings. My conclusion suggests a potential intervention for making sports less tenuous for people who do not fit neatly into the binary system. I ask my readers to imagine new possibilities for “fairness” and “fair” play.

## Chapter 2. Resolving the Ethics of Uncertainty: Blood doping, 1973-1987.

“He was a policeman in a small town in Finland. In recent years, he has been a moderately successful national politician. But for a few days in 1972-and again in 1976-Lasse Viren was the greatest athlete in the world.”<sup>70</sup>

Lasse Viren, or the Flying Finn, quickly rose to the top of the elite running world. As a relative outsider, he won Olympic Gold medals in the 5,000 meter and 10,000 meter events in 1972. He repeated this at the 1976 games. Viren was almost immediately suspected of ‘blood doping.’ In fact, during the 1970s many European Olympic athletes were suspected of blood doping.<sup>71</sup> Sport medicine and physiology researchers became interested in the physiological effects of induced erythrocythmia<sup>72</sup> on bodies; in part, this interest emerged out of rumors that “elite”<sup>73</sup> level endurance athletes were using blood doping techniques to gain Olympic level prestige.<sup>74</sup> These rumors circulated while many other elite endurance athletes denied and condemned the use of blood doping.

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<sup>70</sup> Tim Pears, "The Time Machine," *The Guardian* 2007., 1.

<sup>71</sup> Dave Anderson, "The Blood Scandal," *New York Times* 1976.

<sup>72</sup> Induced erythrocythmia is the medical terminology for increasing the number of red blood cells circulating in the blood via transfusion. Erythrocythmia simply means increasing the number of red blood cells within one body's circulatory system.

<sup>73</sup> Although I will not be drawing explicit attention to the changing definition of “elite” athlete in this chapter, during the 1970s and 1980s “elite” athletes often participated at the top-level of their respective sports. The Olympic games although comprised of amateurs was the top-level for many endurance athletes. During the 1990s as the Olympics began accepting paid professional athletes into the games, the distinction between paid professionals and “elite” Olympic amateurs was blurred for many sports, including endurance sports where athletes could seek paid sponsorship from corporations. In this chapter, professional, “elite,” and “non-elite” distinctions will only be dealt with as they pertain to the technomedical research of blood re-infusion and blood doping.

<sup>74</sup> Kenny Moore, "Getting It All Together," *Sports Illustrated*, August 09, 1976. In this article, Moore links Lasse Viren, the Finnish distance runner, with “blood doping,” or transfusions of his own blood to boost his cardiovascular efficiency before major races.” (4) Other popular press outlets had also reported on the possibility of “blood doping.” Time ran an article in 1973 that reviewed Ekblom's 1972 work. The author suggested that “some Scandinavian and Communist countries already employ such techniques” when referring to autologous blood transfusions for athletic performance enhancement. (1). In 1977, Moore asked the accused Finnish runner if he had used autologous blood transfusion to enhance his performance. Viren denied having done so. NY Times reports also followed these rumors of blood doping in sport during the 1970s. Dave Anderson and Neil Amdur published 3 articles on the subject independent of each other. The rumors of “blood doping” were not confined only to the sports medicine arena. Popular press and rumors between athletes as documented in the popular press contributed to a belief that

Before the 1970s the dominant image<sup>75</sup> of “athlete dopers” aligned more with “power” sports and anabolic androgenic steroid use than with endurance athletes, like Viren.<sup>76</sup> “Blood doping” extended the image of the athlete doper to include elite endurance athletes. Rumors of “blood doping” cast endurance athletes as potential beneficiaries and transgressors before technomedical researchers solidified “blood doping” in the West. Yet, in the West these rumors remained unsubstantiated until that technomedical solidification took place. These technomedical researchers, then, co-produced new moral categories with the “blood doping” technologies. Namely, these new moral categories included a new doper (the blood doper), a transgressive variant of the elite endurance athlete. Like the previous dominant image of athlete dopers, the steroid using powerlifter, this new category was laden with gender values.

Why, then, look at blood doping practices before looking at steroid detecting practices? I have my reasons. First, within the deconstruction of the blood doping practices the binary sex/gender categories solidify. This seems a bit ironic since blood doping in theory need not hold onto the binary. Blood is after all something that all humans have. Second, my larger argument builds off of the arguments presented in this chapter and the next. In these two chapters, normalization and ab-normalization researchers reinforce the sex/gender binary. In the latter two chapters, anti-doping researchers also reinforce the sex/gender binary, however, this is done as they face an ever increasing array of hormonal genders. In these first two chapter, the “blood doping” researchers bind bloody bodies to the binary.

Previously, researchers in the West undertook blood re-infusion studies to make sense of the interrelations of the “body,” “blood” and “cardiovascular system.” During the 1970s, however, many of the researchers conducting induced erythrocythemia studies aimed explicitly at optimizing athletic performance. This chapter focuses on their co-production of this technomedical knowledge and gender

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endurance athletes could and were enhancing performance through injecting additional blood into their bodies.

<sup>75</sup> Gary Downey, "What Is Engineering Studies For? Dominant Practices and Scalable Scholarship. ," *Engineering Studies* 1, no. 1 (2009). Downey uses the term dominant image to describe the taken-for-granted images engineers have of themselves.

<sup>76</sup> John Hoberman, *Testosterone Dreams: Rejuvenation, Aphrodisia, Doping*. (Los Angeles, CA: University of California Press, 2005). Hoberman discusses the history of testosterone use in both medicine and sports. He also links testosterone to dominant forms of masculinity.



normalization that occurred within these “blood doping” studies. This initial normalization marked male subjects as the norm and normal subjects of “blood doping” studies, implicitly, marking female subjects as non-normal. An ethics of uncertainty<sup>77</sup> facilitated this co-production by allowing technomedical researchers to avoid athletic morality issues themselves while producing the grounds on which athletes would be judged. I use the terms ethics and ethical frames interchangeably and I use them to signal the principles and values these researchers used to guide and justify their research.

Using an ethics of uncertainty around “blood doping” claims, American and Canadian researchers worked to determine an effective means of achieving “blood doping.” Arthur Caplan uses the term “ethics of uncertainty” in terms of food additive regulation. Relevant to this work, Caplan questions the model of uncertainty justifying further studies until ‘scientific’ resolution is reached. Caplan suggests that questions of safety “are plainly matters of value, and as such, they can only be answered by examining the moral and political principles that are relevant.”<sup>78</sup> For Caplan, scientific resolution will not answer these questions. I use the term in a similar fashion to Caplan; certainly these technomedical researchers deployed their ethics of uncertainty to justify further research into blood doping. However, unlike Caplan I do not take questions of safety, value, moral and political principles to be knowable in a manor distinct from the technomedical researchers’ ethics.

Blood doping researchers’ ethics relied on the uncertainty that blood re-infusion caused any positive effect on athletes (efficacy uncertainty), uncertainty whether “blood doping” should be thought of as cheating because similar effects were possible through “natural” means (moral uncertainty), and uncertainty surrounding the physiological processes of “blood doping” (process uncertainty). This ethical frame allowed these researchers to bypass the ethics of fairness deployed by sport governing bodies used to judge “blood doping.” Many of the ways in which these researchers deployed this ethics of uncertainty to carry out blood boosting and “blood doping” research become visible in Melvin Williams’ early blood

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<sup>77</sup> Arthur Caplan, "The Ethics of Uncertainty: The Regulation of Food Safety in the United States," *Agriculture and Human Values*, no. Winter-Spring (1986).

<sup>78</sup> *Ibid.*, 182.

doping work. This work also marks the first technomedical<sup>79</sup> attempt to determine the efficacy of “blood doping” as an ergogenic aid. These researchers could easily be viewed as helping to develop doping techniques, and, thus conducting unethical research. However, they largely avoided such charges and continued with their research by shifting from a fairness to an uncertainty ethical frame.

“Blood doping” researchers made “blood doping” a technomedical reality by operationalizing their ethics of uncertainty; they also participated in “normalizations” which sustained dominant gender power relations and created the technical ground for morally judging blood doping athletes. More simply, these researchers defined “normal” humans and “normal” athletes as gendered technomoral entities.<sup>80</sup> Frequently, these processes involved constructing male subjects as the “norm” for blood doping studies. It also entailed marking a set of blood boosting and doping types: “normal” males, “normal” females, “athletes,” and “female endurance athletes.” Each type had a different relationship to the morality issues of blood boosting and doping: both “normal” males and “normal” females were exempt from claims of blood doping but could be blood boosted. As non-athletes they were not subjected to claims of athletic “fairness” or “cheating.” “Normal” males were constituted relationally to “normal” females and “normal” male endurance athletes. “Normal” males and “normal” male endurance “athlete” became the standards through which other categories were defined---implicitly producing many “normal”/“abnormal” pairs.<sup>81</sup>

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<sup>79</sup> Adele Clarke et al., "Biomedicalization: Technoscientific Transformations of Health, Illness, and U.S. Biomedicine." *American Sociological Review* 68(2003). Akin to Adele Clarke's technoscientific biomedicine technomedical signals the highly technical and scientific forms of medicine and medical knowledge produced by these researchers in a sense their work predates or foreshadows Clarke's proposed shift to the biomedical. Rather than explore such broad cultural phenomena as Clarke does this work explores the construction of a specific technomedical and technomoral entity, blood doping.

<sup>80</sup> As stated in the introduction, I use the terms technomoral and technomorality to denote how technomedical researchers produced both technomedical knowledge practices, principles of right and wrong behavior, and, the categorical types related to such principles, i.e. normal, non-normal, ab-normal.

<sup>81</sup> Georges Canguilhem, *On the Normal and the Pathological.*, trans. Carolyn R. Fawcett (Boston: D. Reidel, 1978). Michel Foucault, *Discipline and Punish: The Birth of the Prison* (New York: Random House, 1977). Joan Fujimura, "Sex Genes: A Critical Sociomaterial Approach to the Politics and Molecular Genetics of Sex Determination," *Signs: Journal of Women in Culture and Society* 32, no. 11 (2006). Canguilhem, Foucault and Fujimura all work to show the simultaneous construction of normal and abnormal (or pathological) within the human sciences. In the case of blood doping these categories were also simultaneously constructed. Akin to Fujimura's account of the “normal” being constructed through the “abnormal” developmental pathways of transgenic mice, for blood doping researchers normal/abnormal pairs were simultaneously developed.

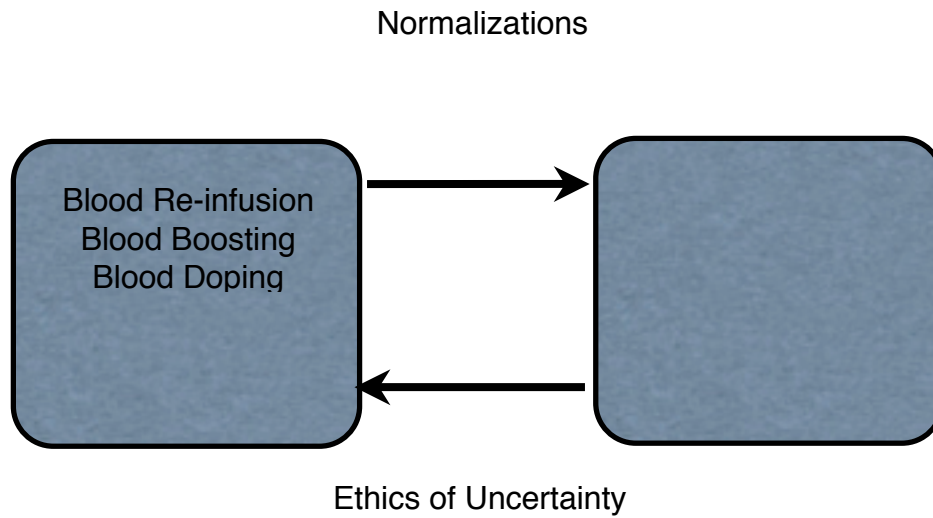
These normalizations produced gendered moral category types relating to “blood doping.” In what follows, the discussion will be limited to the production of “normal” males, “athlete” males, and “endurance athlete” males, although these processes also constitute their female counterparts, as addressed in the next chapter. These normalizations coincided with the production of efficacious, statistically significant performance enhancing, blood re-infusion techniques in the research of Norman Gledhill and his colleagues.

“Blood doping” would remain technomedically and morally uncertain until the late 1980s. In 1987, the American College of Sports medicine issued the first position statement on “blood doping.” With this position, the previous ethics of uncertainty receded some to give way to new certainties. The technomedical researchers who crafted the position condemned the blood doping practice, thereby, solidifying it as a technomoral entity and certifying it as a technomedical reality. Yet, Western researchers remained uncertain about the physiological processes of “blood doping,” how to detect it, and how to enforce their moral condemnation. Hence, an ethics of uncertainty remained intact despite their construction of a new technomorality for “blood doping.”

The chapter traces the solidification of blood doping as a morality claim. Most of the researchers in this chapter did not initially use “blood doping” to refer to blood re-infusion into athletes for athletic performance gain. Until the late 1980s, many technomedical researchers did not consider it immoral to use this technique. These researchers neither viewed the technique as necessarily “unnatural” nor did they believe that using the technique would grant elite endurance athletes an “unfair” advantage over their non-using counterparts. Thus, the terms they used and my own use of blood doping require some clarification. I have footnoted my own uses of blood doping throughout the chapter for clarity and whenever possible I use the author’s terminology for these blood studies and methods. For them “blood re-infusion” and “blood re-injection” refer broadly to any withdrawal and later re-infusion of blood into the same individual or a different blood-matched individual. “Blood boosting” also refers to using this re-infusion technique for performance gain in non-athletes and athletes. They also use the terms “induced erythrocythemia” and “polycythemia” to refer to the blood re-infusion surplus of red blood cells that their

subjects experienced. “Blood doping” refers to the practice of using these techniques on athletes for “unfair” athletic performance gain. “Blood doping” has crystallized as an immoral practice within sports and carries this moral valence which the other terms do not. When I use the term, I use it in this last sense.

**Figure 1.** The Co-Production Processes.



In this chapter, I trace the co-production of blood doping as a technomedical entity with the normalization of gender categories. Blood doping and these gender categories became bound to a new technomorality with this co-production. In what follows I provide a brief summary of relevant historical and cultural contexts of “doping” in the 1970s and 1980s. Then I move to describe Bjorn Ekblom’s studies of blood re-infusion and the role of the uncertain bounds of “endurance athlete” within these studies. Next, I explore how Dr. Melvin Williams deployed an ethics of uncertainty, performed some of the first “blood doping” studies, and began creating moral category distinctions. From this ethics of uncertainty, I move to investigate how Norman Gledhill and his colleagues operationalized this ethics to produce normalized gender categories and “blood boosting” and “blood doping.” Though normalization they rendered more distinctions between “normal males” and “male endurance athletes;” while they crystallized these categories’ relationships to “blood doping.” After this I examine how the American College of Sports Medicine (ACSM) further solidified “blood doping” as a technomoral entity in their

1987 position: these researchers enacted a new technomorality that produced moral types for athletes and non-athletes based on the previous “blood doping” studies.

### ***Prehistory and Context of Doping During the 1970s and 1980s.***

During the late years of the Cold War, there were mounting tensions between Eastern bloc countries and the West around doping in sport. Many of these tensions revolved around the use of anabolic androgenic steroids in sport. It had long been established that anabolic steroids conferred athletic advantages on “power” athletes with many openly admitting to steroid use---including Arnold Schwarzenegger and Ken Patera.<sup>82</sup> The origin stories of anabolic steroids in American Olympic weight lifting suggested that Soviet researchers had first synthesized anabolic steroids for use in sport.<sup>83</sup> In the United States a doctor to the Olympic team, Dr. John Ziegler, learned of the Soviet use and began working in conjunction with CIBA pharmaceuticals to synthesize anabolic steroids for American weight lifters. By the 1970s, anabolic steroids had permeated many more sports, and many athletes viewed their use as immoral. Frank Shorter, an American marathoner, was an outspoken critic of steroid use, claiming he had lost the gold medal because his East German competitor was using anabolic steroids.<sup>84</sup> As Daniel Rosen puts it, steroids were the dope of choice for athletes during the 1970s.

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<sup>82</sup> Arnold Schwarzenegger competed in bodybuilding competitions and won the Mr. Universe competition when he was 20 years old. Ken Patera competed in strongman competitions, like the World’s Strongest Man competition, where athletes perform a variety of tests of strength centered around lifting or moving heavy objects. Weightlifting is the prominent mode of training for both event types.

<sup>83</sup> Daniel M. Rosen, *Dope: A History of Performance Enhancement in Sports from the Nineteenth Century to Today* (Ann Arbor: University of Michigan Press, 2008). For more on this topic, I suggest Rosen’s account 15-16 and 25-30. Rosen gives an origin story of steroids in the USA that suggests that Dr. John Ziegler, the physician to the 1954 Olympic weightlifting squad learned of testosterone use from his Russian counterpart and then decided to synthesize it back home to aid our weightlifting team. Dr. Ziegler worked with athletes at the York Barbell Club to determine the efficacy of dianabol, the synthesized anabolic androgenic steroid he produced with CIBA pharmaceuticals, for performance enhancement. Although this is the origin story frequently told about anabolic androgenic steroids’ entrance into sport in the United States, I am not claiming it as truth or representative of reality. For I am certain that anabolic androgenic steroids permeated American sports in many different ways. This story does, however, provide historical context and insight into the views of drug-use in sport at the time and for this reason I find it worth telling.

<sup>84</sup> 2002 Senate Hearing Subcommittee on Consumer Affairs, Foreign Commerce and Tourism, June 19, 2002. Frank Shorter would later serve as the first president of the United States Anti-Doping Agency.

By the end of the 1970s<sup>85</sup> anabolic steroids were banned from Olympic use and detection methods were established and refined, making the enforcement of this ban possible. As Rosen astutely points out anabolic steroid-use was primarily done by “power” athletes but endurance athletes also partook. In the 1970s Bernard Thevenet, a two-time Tour de France winner, admitted to using testosterone and other steroids to aid in recovery. This practice continued into the 21<sup>st</sup> century within cycling.<sup>86</sup> Floyd Landis, the 2006 Tour de France winner, tested positive for excessive amounts of testosterone. Thus, endurance athletes in the 1970s were not free from suspicion of doping. Yet, doping did not entail blood transfusion in part because no sport governing body had banned the practice. Further, technomedical researchers had not established that blood doping could enhance endurance performance.<sup>87</sup> Nevertheless, from popular media reports and athlete accounts it seemed that blood doping as a new form of enhancement was making inroads into endurance sport.

As the 1970s ended there were mounting suspicions over the use of blood doping within endurance sports. Several journalists created scandal around Lasse Viren’s Olympic accomplishments by accusing him of blood doping. Blood doping scandals continued into the 1980s, when the US cycling team won the gold medal at the Los Angeles games while blood doping. The North American technomedical community created blood doping and blood dopers as technomoral entities and categories through their research and subsequent position statement.<sup>88</sup> Many sport governing bodies regarded such techniques as “cheating:” these researchers changed the shape of both the morality claims around blood doping and the processes athletes used to blood dope while informing the governing practices of doping.

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<sup>85</sup> By the 1970s, “doping” within athletics was largely made sense of as performance enhancement through pharmacological intervention, i.e. drug use. Both Rosen and John Hoberman discuss the changing definitions of this term in their books.

<sup>86</sup> Ibid.

<sup>87</sup> Shalender Bhasin et al., “The Effects of Supraphysiologic Doses of Testosterone on Muscle Size and Strength in Normal Men,” *The New England Journal of Medicine* 335, no. 1 (1996). Ironically, Western technomedical researchers did not establish the performance enhancing effects of testosterone---an anabolic androgenic steroid---until 1996.

<sup>88</sup> Michael Kalinski, “State-Sponsored Research on Creatine Supplements and Blood Doping in Elite Soviet Sports,” *Perpectives in Biology and Medicine* 46, no. 3 (2003). Blood doping was likely known and used by Communist countries before these Western researchers technomedically reproduced techniques that rendered athletic performance enhancement.

### ***1970-1980: How Uncertainty Shaped the “Endurance Athlete” and Blood Doping.***

Technomedical researchers and sport governing bodies articulated ambivalent views towards the practice and morality of blood doping during the 1970s. These researchers pursued the solidification of blood doping<sup>89</sup> through this ambivalence and uncertainty. Re-infusion researchers, like Bjorn Ekblom, established links between red blood cell mass and increased performance capacities in non-athletes and without reproducible results.

Dr. Bjorn Ekblom conducted research on blood re-infusion while working at the Karolinska Institute. He found that re-infusion increased performance capacities using non-trained/“normal” male subjects. Later, the technomedical blood doping community viewed his use of “non-trained”/“normal” subjects as an unacceptable experimental parameter for determining whether athletes could benefit from blood doping.<sup>90</sup> These later researchers argued that the increased performance capacities of the former subjects were the result of the training they underwent during the study rather than the blood re-infusion technique itself.<sup>91</sup> Nevertheless, Ekblom recorded an increased performance effect linked to blood re-infusion.

While later researchers would work to create and resolve distinctions between “normal male,” “male athletes,” and “male endurance athlete” subjects, Ekblom’s early work treated male endurance athletes as “normal.” The relationship between endurance athletes and “normal” subjects started to resolve during the 1970s. For these later studies, Ekblom’s “normal”---untrained---subjects remained suggestive but were not reliable enough for the resolution of blood doping. Instead, Ekblom’s work often served as complimentary evidence of the efficacy of blood doping for researchers using athletic and normalized subject pools of the 1970s. Later researchers defined “athletes” in relation to “normal males;”

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<sup>89</sup> Here I use blood doping as my own term.

<sup>90</sup> Ekblom also “failed” to use a double-blinded system for testing this would be ergogenic aid. Later researchers interested in blood re-infusion as an ergogenic aid, blood doping, would condemn his study on both grounds.

<sup>91</sup> Bjorn Ekblom, Alberto Goldberg, and Bengt Gullbring, "Response to Exercise after Blood Loss and Re-Infusion," *Journal of Applied Physiology* 33, no. 2 (1972)., Melvin Williams, "Effects of Blood ReInjection Upon Endurance Capacity and Heart Rate.," *Medicine and Science in Sport* 5(1973).

implicitly they asked, were athletes just trained “normal” bodies or did they possess qualitative distinctions from “normal” people?

These researchers defined the “normal male,” “male athletes,” and “male endurance athletes” through an ethics of uncertainty around blood doping. This ethics of uncertainty opened space for constructing blood doping technologies in new ways. From this ethics of uncertainty a new ethics of fairness emerged. This ethics of fairness was much more technically certain than those previously used by anti-doping regulators. The ethics of fairness used by anti-doping regulators for judging “blood dopers” until this time implicitly condemned the use of “non-natural” substances and methods for performance gains; however, they did not directly regulate “blood doping” or other “pseudo-natural”<sup>92</sup> means of achieving athletic gains. These “pseudo-natural” methods created detection challenges, as the ethical frame for judging athletes was based on the direct technomedical detection of “non-natural” substances. Their new ethics of fairness presented blood doping as unfair yet not regulatable.

***An Ethics of Uncertainty<sup>93</sup>: Technomedically Introducing “Athletes” to Blood Re-Injection.***

*“Blood doping, the infusion of blood to the athlete, is designed to elicit hypervolemia and/or polycythemia.”<sup>94</sup>*

In 1973, Melvin Williams<sup>95</sup> initiated the first blood re-injection studies using “athletes” as subjects. During this study, he enacted an ethics of uncertainty by introducing “athletes” and “endurance

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<sup>92</sup> By “pseudo-natural,” I mean methods that seemed to mimic either natural processes, like acclimation to altitude, or natural hormones, like testosterone.

<sup>93</sup> Arthur Caplan, “The Ethics of Uncertainty: The Regulation of Food Safety in the United States,” *Agriculture and Human Values*, no. Winter-Spring (1986).

<sup>94</sup> Melvin Williams et al., “Effect of Blood Re-injection Upon Endurance Capacity and Heart Rate,” *Medicine and Science in Sports* 5, no. 3 (1973), 181.

<sup>95</sup> Melvin Williams (b. December 9, 1937) received his doctoral degree from the University of Maryland in 1968 after completing a Master’s in education at Ohio University (1963) and his bachelors degree at East Stroudsburg State University (1962). His early research focused on pharmaceutical, chemical and nutritional athletic performance enhancers or ergogenic aids. From his dissertation on the effects of small to moderate alcohol dosage on fatigue of the forearm flexors onward Williams carved a niche in ergogenic aid, looking at techniques and substances with controversy about their effects on sports performance (Melvin H. Williams, “The Effect of a Small and Moderate Dose of Alcohol on Fatigue Parameters of the Forearm Flexor Muscles” (University of Maryland, 1968)). He wrote and edited several books which



athletes” to blood re-injection research. This disrupted the ethics of fairness surrounding blood re-injection as an ergogenic aid and potential cheating technique for endurance athletes. Hence, the ethics of uncertainty allowed Williams and his successors to pursue blood re-injection research shielded from morality claims launched by the popular press, athletes, and others. These morality claims largely arose from athletes and reporters not technomedical researchers and sports policy makers. For Williams, the question was: how could blood re-injection be unfair if it did nothing for athletes? This deployment allowed for the co-production of new moral category types and blood re-injection by opening space for research through moral, technical and physiological uncertainties. Without these, blood re-injection as an ergogenic would have remained a rumor, or perhaps a legal rather than technical entity. Blood doping eventually solidified as specific causal practices and measures.<sup>96</sup> The following traces Williams’ deployment of the ethics of uncertainty as a precursor to this process in which Williams began to mark the distinctions between “normal males,” “male athletes,” and “male endurance athletes.”<sup>97</sup>

Williams saw ergogenic aids as a means to increase athletic performance. Early in his research Williams maintained a position similar to many of his colleagues at that time: there was a disconnect between the “sports ethic rationale” and the athletes’ goal of winning. He saw the “sports ethic rationale” as akin to playing by the rules imposed by sport governing bodies. The athletes’ goal of winning matched more closely to his communication with athletes that revealed “prior to competition they (the athletes) are in such a frame of mind that they will take anything to increase performance provided it is not lethal.”<sup>98</sup>

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include an edited collection on *Ergogenic Aids in Sport, Beyond Training: How Athletes Enhance Performance Legally and Illegally*, and several textbooks. In *Beyond Training*, Williams explained that his interest and experience with ergogenic aids derived from his participation in sports as a football player in college to a marathoner and coach post-graduation. He founded the Human Performance Laboratory in 1968 after completing his dissertation. As an avid marathoner, he often served as one of his own test subjects during the blood infusion studies.

<sup>96</sup> This is my use of blood doping. Although, Williams used both the term blood doping and the term blood re-injection to describe his early work.

<sup>97</sup> Williams et al., "Effect of Blood ReInjection Upon Endurance Capacity and Heart Rate.", Williams variously uses “male athlete,” “other athletes,” and “trained athletes” to define his subject pool. Importantly he signals their “ungendered” or gender-norm position by dropping their biological sex/gender category multiple times.

<sup>98</sup> Melvin H. Williams, *Beyond Training: How Athletes Enhance Performance Legally and Illegally* (Champaign: Leisure Press, 1989)., 8.

For Williams making a case against doping based on health hazards made sense; however, a prohibition based on athletic performance improvements seemed paradoxical due to the competitive goal of athletes--winning.<sup>99</sup> Williams began blood re-injection research---a morally grey research subject---by working between the “sports ethic rationale” and the “athletes’ goal of winning.”<sup>100</sup>

Melvin Williams founded the Old Dominion University Human Performance Laboratory<sup>101</sup> in Norfolk, VA. From here he began resolving the technomedical uncertainties of blood re-injection as an ergogenic aid in 1973. The role of uncertainty in the morality claims surrounding blood doping becomes clearer by following Williams’ work.<sup>102</sup> There were three major sites that contributed to the overall technomoral uncertainty in Williams’ research: subject uncertainty, response uncertainty, and statistical uncertainty. Through these specific sites of uncertainty Williams maintained an ethics of uncertainty while producing technomedical knowledge of blood re-injection techniques.

’All the sports authorities say drugs don’t increase performance,’ said Williams, who has conducted other medical studies on the effects of alcohol, amphetamines, caffeine and hypnosis on athletic performance. ‘Yet they ban them on ethical grounds. Why ban them if they don’t increase performance?’<sup>103</sup>

For Williams, moral certainty coincided with technomedical certainty, i.e. the established efficacy of blood re-injection (efficacy certainty) to attain athletic performance enhancement. Blood re-injection

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<sup>99</sup> Melvin H. Williams, *Drugs and Athletic Performance* (Springfield: Charles C. Thomas, 1974)., 15. He quotes one of his colleagues on page 11, “In 1965, Fishbach (163) stated that the classical doping agents should be prohibited, namely the stimulants and narcotics, but that sports pharmaca which, at normal dosage, have a physiological but nontoxic action should be permitted under sports-medical control.” Williams also shows a sophisticated understanding of doping as in a definitional struggle and laden with the “national and international” drug problem.

<sup>100</sup> Neil Admur, "Blood-Doping Controversy Thickens," *New York Times* 1977.

<sup>101</sup> The current mission of the ODU HPL is “to improve the scientific understanding of human movement using physiological measurement tools; to educate undergraduate and graduate students in the use of and basis behind these tools; to train students to professionally apply their knowledge in all clinical and practical applications of exercise testing and measurement; and to provide a regional community resource for body composition and other physiological testing.”

<http://education.odu.edu/esper/academics/labs/hpl.shtml>

<sup>102</sup> This is my use of blood doping.

<sup>103</sup> Neil Admur, "Blood-Doping Controversy Thickens," *New York Times* 1977.

existed separately from such morality claims because no technomedical researcher had demonstrated its efficacy in athletes.

### *Subject Uncertainty.*

In Williams' 1973 work he created subject uncertainty through his subject choice---male athletes---and the comparison of this subject group to Ekblom's previous re-infusion study. Williams also marked the categories, "normal male," "male athlete," and "male endurance athlete" in relation to blood re-injection. Now, "male athletes" were potential blood dopers.<sup>104</sup> By using, "[t]wenty male athletes" as his test subjects, Williams both marked the distinction between the "normal" (non-athletic) bodies of previous studies and these "athletes."<sup>105</sup> Williams marked these men as distinct because they were "highly trained distance runners and other athletes in training at Old Dominion University."<sup>106</sup> Yet, they were also similar to "normal" men because they were men. Indeed, it was specifically their training that set them apart from the "normal." This training made them super-"normal"---training added to the normal male bodies the strength to endure.

Retrospectively, Williams asserted that previous researchers, like Ekblom, had not accounted for this distinction between "normal" (non-trained) and "athlete" subjects. Hence, these studies remained elusive due "a training effect" that "normal" subjects would experience and "athletes," especially "endurance athletes," would not.<sup>107</sup> <sup>108</sup> Williams rendered "athletes" and "endurance athletes" as distinct

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<sup>104</sup> Again, this is my use of blood doping and I use it here to signal the technomedical potential of using blood re-injection to gain athletic advantage. For me, this potential is imbued with a new technomoral potential to cheat.

<sup>105</sup> Ibid., 181.

<sup>106</sup> Ibid., 182.

<sup>107</sup> Ibid., 181. The "training" effect refers to the adaptations a person undergoes through either aerobic or resistance training. These adaptations include increases in muscular strength, improved cardiovascular output, and changes to the neurohumoral (muscle memory) system that improve one's ability to do aerobic or strength exercises overtime.

<sup>108</sup> Bjorn Ekblom, Alberto Goldberg, and Bengt Gullbring, "Response to Exercise after Blood Loss and Re-Infusion," *Journal of Applied Physiology* 33, no. 2 (1972). B. Ekblom, G. Wilson, and P. O. Astrand, "Central Circulation During Exercise after Venesection and Re-Infusion of Red Blood Cells," *ibid.* 40, no. 3 (1976). Later Ekblom would return to blood doping studies and look at trained subjects implicitly acknowledging the possible training effect in his first study. However, Ekblom did not perform a double-

enough to merit their own research. Therefore, for sports physiologists doing similar blood research, the “athlete” became a previously trained and in-training super-“normal” body that might benefit from such blood re-injection techniques. For Williams measuring the efficacy of blood re-injection required using such subjects, who would not confound research results through “training effects.” Yet, the “normal” subject and “athletes” of this time were not so completely distinct that studies of one could not be used to predict the outcomes of studies of the other. That is Williams based his blood re-injection methodology on previous research. However, the moral valence carried by subject type was distinct. For Williams blood doping, a potentially transgressive process, required (endurance) athletes; whereas, non-athletes could undergo blood re-infusion and blood boosting---non-transgressive processes.

*Response Uncertainty.*

In this initial work, Williams produced response uncertainty regarding the origin of the responses he observed and the character of these responses. Williams could not distinguish between “real” responses to blood re-injection and training responses in his own subjects. Likewise, Williams viewed blood re-injection as a technique that mimicked normal and “natural” processes, hence, its response differed from “non-natural” substances in moral character. This mimicry also made the origin of any observed response difficult to assess. Sport governing bodies and many sports physiologists viewed “non-natural” performance enhancing substances as morally wrong for athletes to use because of both the unfair advantage they gave athletes over their non-using competition and their “non-natural” character.

Williams implicitly asked, did the subjects experience responses beyond that and distinct from “training” effects and “natural” adaptations? He found that:

“the normal cardiovascular changes associated with the onset and continuation of exercise, i.e., increased cardiac output, increased a-v oxygen difference, vasodilation in active muscles, decreased blood volume and increased hemoglobin concentration seem to override the small beneficial, or detrimental, effects of polycythemia produced by the infusion of whole blood or RBC...[a]lthough trained athletes served as subjects in the

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blind studied as the North American protocol put forward by Williams seemed to demand. I think this probably gets at cultural differences in what methodologies count for sports physiologists in Sweden and North America but will not be looking at these currently.

present study, it would appear a training effect, rather than the effect of the infused hematological components, was the causative factor for the lower exercise heart rate in the tests following reinjection.”<sup>109</sup>

For Williams these athletes experienced a training effect response.<sup>110</sup> Hence, this response uncertainty arose from the mixed character of Williams’ athletes. Williams used “highly trained distance runners and other athletes in training.”<sup>111</sup> Williams claimed a “training effect” was possible for the “other athletes,” and, this further marked the “endurance athlete” as distinct from these “other athletes.” Although both types were trained-supernormal body types, the types of training these athletes underwent produced this distinction. “Highly-trained distance runners” underwent improvements to their cardiovascular system that many other types of athletes would not necessarily undergo. Further, there existed differences in the training regimes of these runners that created distinctions within the group of already cardiovascularly improved athletes making the possibility of determining the origin of the response difficult even for this group. Response uncertainty abounded as distinctions within and between these types arose.

The technical aspects of blood re-injection as an ergogenic aid contrasted with the pharmaceutical enhancements that were deemed to create “unfair” advantages---blood re-injection was a “physiological ergogenic aid” while amphetamines, caffeine and anabolic steroids were “pharmaceutical” aids.<sup>112</sup> Although Williams acknowledged blood re-injection was “an artificial means” of achieving a “normal” change, Williams aligned the effects of blood re-injection with those of “chronic endurance training” and

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<sup>109</sup> Ibid., 185.

<sup>110</sup> Williams used athletes to account for the “training effect” witnessed in Ekblom’s study. And, his results on these athletes simultaneously cast them as uncertain, statistical significance was not established for blood re-infusion, but also potential benefactors, the athletes did experience faster run times after blood re-infusion. The athletes would not receive technomedically quantifiable benefits from his method, however, the possibility existed for other similar methods to confer performance advantages on their bodies---like Ekblom had conferred upon the bodies of normal subjects during the 1960s.

<sup>111</sup> Ibid., 182.

<sup>112</sup> Williams, Melvin H.(ed.) *Ergogenic Aids In Sport*, Human Kinetics Publishers: Champaign (1983), 100-219. To be fair Williams recognized these distinctions as somewhat arbitrary but they were meaningful enough for him to include them in two of his texts.

“acclimatization to altitude”<sup>113</sup> rendering it morally ambiguous as it gave athletes an advantage that they could easily attain through these other means.

The increases Williams observed were “normal physiological responses of the normal body in an attempt to increase oxygen uptake capacity to compensate for increased metabolic demands or environmental conditions.”<sup>114</sup> That is training or living at altitude produced similar effects---there was further uncertainty where the performance-gain response originated. Distinctions between athlete types, the possibility of differences in “the highly trained runners” training regimes, and the otherwise “normal” responses---“increased cardiac output, increased a-v oxygen difference, vasodilation in active muscles, decreased blood volume and increased hemoglobin concentration”---allowed Williams to introduce this response uncertainty.

With this response uncertainty, Williams further demarcated the relationships between “normal men,” “male athletes,” and “male endurance athlete.” “Normal men” were untrained, yet, experience similar physiological adaptation to the other two categories. “Male athletes” were trained although in manner distinct from “male endurance athletes.” “Male endurance athletes” trained through different training programs aimed at increasing their cardiac output, delivery of oxygen to their active muscles through vasodilation, increased a-v oxygen difference, and increased hemoglobin concentrations. Yet, all males could achieve these effects through training.

#### *Statistical Uncertainty.*

Williams further created uncertainty through statistical significance. Williams was unable to attribute statistical significance to the responses of his subjects to re-infusion. Williams hoped to correlate performance effects to re-injection and, thereby, establish quantified statistical significant gains in athletic performances. Williams sought this, whereas, many previous researchers had not sought to create statistical correlations in their re-infusion data. This attempt to establish statistical significance

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<sup>113</sup> Williams, 181.

<sup>114</sup> Ibid., 181.

foreshadowed the quantification and statistical normalization of blood doping and blood dope recipients that occurred in later research.<sup>115</sup> Williams inability to statistically correlate performance gains and blood re-injection rendered blood re-injection uncertain as a performance enhancer, and, hence, enabled later researchers to continue to undertake similar research.

In Williams' study, "[t]he repeated measures ANOVA revealed no significant differences between treatments ( $F=0.15$ ) or trials ( $F=0.84$ ) for running time to exhaustion."<sup>116</sup> However, subjects who received blood experienced significantly lower post-re-injection exercising heart rates that could have been thought of as a performance improvement.<sup>117</sup> Yet, for Williams this bodily experience remained statistically insignificant. Williams defined "statistical significance" in terms of running time to exhaustion, as such he did not demonstrate large enough performance gains to statistically demonstrate the ergogenic efficacy of blood re-injection. For Williams (and many other researchers), as long as the statistics did not reveal more significance, blood re-injection was not efficacious and it remained morally uncertain.

These uncertainties enabled Williams to "ethically" conduct research on blood re-injection. By simultaneously linking the morality claims of blood re-injection to efficacy claims and naturalizing blood re-injection responses, Williams maintained his own ethical character while foreshadowing what would be the ground for judging the morality of "endurance athletes." Eventually, blood doping endurance athletes would be defined through statistical measurements of their hematological components.<sup>118</sup>

Williams created a technomoral uncertainty that resonated with notions about performance improvement specific to his context. Simultaneously, blood doping which is "the infusion of blood to the athlete, is designed to elicit hypervolemia and/or polycythemia."<sup>119</sup> Hence, he cast athletes as the potential benefactors, and thus transgressors, if blood doping were to become morally certain. Currently, many

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<sup>115</sup> These are my uses of blood doping and blood dope.

<sup>116</sup> Ibid., 182.

<sup>117</sup> Ibid. Williams included himself amongst the study subjects. Williams was a marathon runner at the time.

<sup>118</sup> This is my use of blood doping.

<sup>119</sup> Ibid. 181. This is Williams use and definition of blood doping.

sport governing bodies assume that most technomedical interventions for “non-therapeutic” purposes should be considered “unfair” or potentially “unfair.” Further, “unfair” performance improvement largely coincides with a technoscientifically measured positive change in the athlete’s performance from “unnatural” processes or products. For Williams, blood doping gave athletes the potential to reach a naturally attainable state that did not necessarily or significantly increase performance nor did it present health risks. As the technomoral meanings of blood doping solidified it became both “unfair” and “unnatural.”

Before the technical and moral crystallization of blood doping, blood doping athletes were judged primarily on social grounds. As in the media, these endurance athletes were dubbed cheats for breaking the rules of their respective sports and many other athletes also deemed them cheats. However, sport governing bodies relied on technomedical means of detecting and verifying “cheating” or “doping” athletes and their regulatory frame left “blood doping” undetectable. Hence, these “blood doped” athletes were only subjected to “social” claims of doping. Blood doping would have to crystallize before athletes became subjected to technomoral claims of cheating like the statistically and technomedically transgressive athletes. After blood doping crystallized anti-doping researchers determined technomedical means of detection athletes using these techniques. These means often relied on statistical models of an individual’s hematological composition to render technomoral detection decisions.

### ***Normalizing Normocythemia: Making Blood Boosting Work.***

Working in this technomorally uncertain space, Canadian researchers, Norman Gledhill and his colleagues, began to investigate the efficacy of blood re-infusion for boosting in 1978.<sup>120</sup> These

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<sup>120</sup> Norman Gledhill and his colleagues were at York University’s Hospital for Sick Children and the Canadian Red Cross Blood Transfusion Service, Toronto, ON. Currently, Gledhill is part of the faculty in the Kinesiology and Health Science department at York University. <http://www.yorku.ca/gradkabs/faculty.html#19> “Dr. Gledhill has held the offices of President of the Sport Medical Council of Canada and President of the Canadian Society for Exercise Physiology and Chair of the CSEP “Health and Fitness Program.” [www.oshf.ca/CMFiles/Speakerbios.pdf](http://www.oshf.ca/CMFiles/Speakerbios.pdf). Gledhill received his doctoral degree from the University of Wisconsin in 1976. His dissertation was entitled “Pulmonary Ventilation-Perfusion Distribution in Man with Changes in Body Position, During Exercise and During



researchers pushed beyond Williams' uncertain technology while implicitly relying on an ethics of uncertainty to conduct their own research. These researchers created new uncertainties by reframing the blood boosting problem for technomedical researchers as a problem of reestablishing normocythemia and then achieving a "polycythemic" state. Likewise, these uncertainties emerged as the researchers juxtaposed previous results to their own results and methodologies, much like the tactic Williams used to create technomoral uncertainty. Gledhill and his colleagues simultaneously established technomedical processes for realizing performance gains through blood boosting and further solidified distinctions and similarities between "normal men" and "male athletes" such that male became the "norm" for blood boosting studies. Further, they normalized the process of blood boosting on these male bodies. As they created this norm and normalized blood doping they also produced moral gender categories in relation to blood boosting. Their technomedical normalization subsequently allowed for a reassertion of an ethics of fairness.

Specifically, Norman Gledhill and his colleagues produced normalized normocythemia, "normal men," and "male athletes" by suggesting that previous blood re-infusion studies relied on the blood loss transfusion model. Further, they suggested that a move toward a model for athletic enhancement was necessary. Previous researchers measured the pre-withdrawal states of their subjects but they had not attempted to reestablish these levels and correlate this reestablishment to performance gains---this crucial technical shift came with Gledhill's blood boosting problem reframing.<sup>121</sup> Again, an ethics of uncertainty shielded these researchers from moral claims about blood boosting as performance enhancement and

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Hypoxia." Gledhill maintains research interest in "Respiratory and Cardiovascular Physiology Relating to Limiting Factors in Human Performance."

Norman Gledhill et al., "An Optimal Method of Storing Blood for Blood Boosting," *ibid.* (1978). Initially, Gledhill and his colleagues labeled their research as "blood boosting" research or "induced erythrocythemia." It's not until 1982 in a review article that he uses the term "blood doping." Norman Gledhill, "Blood Doping and Related Issues: A Brief Review," *Medicine and Science in Sport and Exercise* 14, no. 3 (1982). In this review article, Gledhill does not condemn the practice of blood doping but does suggest that the IOC take a position on the practice.

<sup>121</sup> Norman Gledhill et al., "An Optimal Method of Storing Blood for Blood Boosting," in *Medicine and Science in Sports* (1978), 40.

potential stigma for working in this area.<sup>122</sup> From this retrospectively imposed uncertainty about when bodies reestablished “normal” blood levels and its correlation to post-re-infusion performance gain, they began a technical resolution of blood boosting. This technical resolution coincided with the normalization of normocythemia for “normal men” and “male athletes.”

The normalization took part in two phases. First, normocythemia was technically resolved on (and through) “normal” male bodies. The process itself was worked out while these bodies became understood as one “normal” male body---a mathematical average body that later served as a norm for blood boosting and aligned with a value system that positioned males and male endurance athletes as the standard body types within blood boosting and similar research. As will become clearer in the following chapter, male bodies were seen as less complicated than female bodies by these researchers. During the second phase, researchers normalized male endurance runners by measuring their hematological parameters, averaging these values into one normal set, and carrying out procedures that rendered the subjects more like one another. Hence, through this normalization these researchers created a “normal” set of hematological results for “male endurance athletes,” that further, demarcated the distinctions between “normal males” and “male endurance athletes.” The next two subsections detail this normalization. During both phases Gledhill and his colleagues created male bodies as the norm for blood boosting, and through such practices they embedded gender<sup>123</sup> distinctions within the “norms” of blood boosting and subsequently blood doping.<sup>124</sup>

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<sup>122</sup> Although, I will not take up the ethics of uncertainty in this section it is important to point out that it was operating in their work. Here I hope to focus more on the normalization and technical resolution aspects that occurring.

<sup>123</sup> I use the term gender here to denote the researchers production of distinctions between male and female bodies that upheld larger dominant cultural beliefs about the distinctions between male and female bodies.

<sup>124</sup> Here I use blood doping to denote the technomorally crystalized technique of re-infusing blood into athletes for athletic gain which the ACSM condemned.

*Phase 1: "Normal" Blood Boosting.*<sup>125</sup>

Gledhill and his colleagues began by measuring the red blood cell count, hematocrit level and hemoglobin concentration in "4 normal males."<sup>126</sup> Then they removed ~1000cc of blood from these men and placed it in storage. After this Gledhill and his colleagues found that these men experienced an 11% decrease in these values, thereby signaling a sub-normocythemic state post blood removal. The researchers continued to monitor the blood levels of the "normal males" and determined that after five to six weeks they regained pre-withdrawal hematological levels, normocythemia.<sup>127</sup>

From this Gledhill and his colleagues established the five to six week post-withdrawl timeframe as the "optimal" time to re-infuse blood to blood boost "normal males." The researchers had stored the withdrawn blood using high glycerol freezing---a method previous researchers had not used. This method and the time schedule allowed the subjects to regain normocythemia and it kept their red blood cells viable. Now, these "normal" subjects could experience polycythemia and potentially athletic performance gains, more specifically endurance gains.

For these 4 subjects hemoglobin, hematocrit, and red blood cell "values increased 8%" 24 hours after re-infusion and "11% after 1 week."<sup>128</sup> Gledhill and his colleagues reported the subjects' responses as these average values. In doing so, he collapsed their individual results into one response---a "normal" response. With this they produced his "normal" male subject and also formed the "normal" male blood booster---a mathematically measured male non-athlete who experienced hematological gains potentially linked to athletic performance gains through this type of blood re-infusion. Yet, all of this required the subjects to regain pre-withdrawal blood levels, normocythemia.<sup>129</sup> Gledhill and his colleagues resolved normocythemia as a measured pre-withdrawal blood state that "normal males" regained in five to six weeks.

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<sup>125</sup> Gledhill et al., "An Optimal Method of Storing Blood for Blood Boosting.", 40. Gledhill uses the term "blood boosting" and not "blood doping."

<sup>126</sup> Ibid.

<sup>127</sup> Ibid., 40.

<sup>128</sup> Ibid., 40.

<sup>129</sup> This normocythemia also required storage methods capable of maintaining viable blood cells for this time.

“Normal” blood boosters were not yet subjected to the morality claims (cheating) that would eventually be attached to “athlete” blood dopers<sup>130</sup>. Rather, these “normal” blood boosters served as evidence for blood doping and paved the way for “athlete” subjects to be tested. Like in Williams’ study, these “normal” males contrasted with “athletes” because they were not trained.<sup>131</sup> This distinction lent to inferential space across the two subject types in future studies. For these researchers the individuals within these pools were more similar than distinct during the late 1970s when “athletes,” especially endurance “athletes,” were understood to be trained otherwise “normal” men. The “normal” subject of this research experienced polycythemia free from moral concerns about athletic performance because it was both an abstraction and derived from “normal” males who were not seen as potential endurance athlete cheats.

*Phase 2: From Normocythemia to Induced Erythrocythemia in “Athletes.”*

During the second phase of normalization, Gledhill and his colleagues investigated the time course for the reestablishing normocythemia in “athletes”---represented by highly trained male runners. Implicitly, they argued that previous studies on non-athletes could not adequately determine how to induce polycythemia in “athletes.” At the outset for Gledhill and his colleagues what differed between the “normal” subject and these athletes was their training: “we employed subjects who maintained their aerobic fitness at a consistently high level and who were accustomed to exhaustive treadmill work.”<sup>132</sup> However, their work marked more distinctions between these two groups.

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<sup>130</sup> This is my usage of blood doper.

<sup>131</sup> F. Buick et al., "Effect of Induced Erythrocythemia on Aerobic Work Capacity," *Journal of Applied Physiology* 48, no. 4 (1980), 636.

<sup>132</sup> *Ibid.*

**Table 1.** Replication of “Table 2. Mean Hematologic and 2,3-DPG Values.”

Variable	C <sub>1</sub>	C <sub>2</sub>	Sham	24h 0m 0s	168h 0m 0s	2688h 0m 0s	±SE
	Rest						
Hb, g/100mL	15.1	15.1	15.2	16.3*	16.5*	15.0	0.2
Hct, %	43.6	44.0	43.6	47.2*	47.9*	43.7	0.5
2,3-DPG, μmol/Hb	13.8	14.6	14.5	14.3	14.6	14.6	0.3
	Endurance Run						
Hb, g/100mL	15.8	15.7	16.6	16.7*	16.6*	15.3	0.2
Hct, %	46.7	46.0	45.7	48.4*	48.6*	44.9	0.3

Values are means from 11 subjects. \*Significantly different from C<sub>1</sub>, C<sub>2</sub>, sham, and 16-wk values.

Gledhill and his colleagues determined these trained runners required “up to 10 wk for the hematology values to return to control levels,”<sup>133</sup> setting the “optimal” time course for “male endurance athletes” and marking them as distinct from the previous “normal males” who only required 5-6 weeks to reestablish normocytomia. These researchers normalized these male athletes by making sure the athletes were in the same phase of their training. Likewise, Gledhill and his colleagues measured their “control (C1) hematologic and performance values”<sup>134</sup> which they then used to determine when the athletes regained normocytomia (“7.3 wk” after blood removal).<sup>135</sup> Hence, they standardized re-infusion timing for these athletes based on this and they created the return to normocytomia as a “norm” and precursor to endurance athlete induced erythrocythemia. The researchers standardized the athletes in terms of their training and normocytomia. This normalization continued when Gledhill and his colleagues measured performance gains in their subjects: “Maximum O<sub>2</sub> consumption (VO<sub>2</sub>max) and running time to exhaustion were significantly increased 24h post re-infusion (5.11-5.37 l\*min<sup>-1</sup> and 7.20-9.65 min,

<sup>133</sup> Gledhill, "Blood Doping and Related Issues: A Brief Review.", 185

<sup>134</sup> F. Buick et al., "Effect of Induced Erythrocythemia on Aerobic Work Capacity," *Journal of Applied Physiology* 48, no. 4 (1980)., 637.

<sup>135</sup> *Ibid.*, 637.

respectively) and 7 days post re-infusion.”<sup>136</sup> The athletes were rendered numerical ranges of performance gains. Gledhill and his colleagues were also able to attribute statistical significance to their findings, further solidifying the process of induced erythrocythemia and resolving previous statistical uncertainty.

Gledhill and his colleagues mathematically rendered these athletes into a standard set of measurements. They continued this process by collapsing them into a standard subject, see Table 1 above. Here Gledhill and his colleagues collapsed their 11 subjects into a single mean, hemoglobin (Hb), hematocrit (Hct), and 2,3 DPG set. Through these mathematical standardizations they also normalized the “male endurance athlete”---now, this athlete was expected to experience increases in these values after re-infusion and these increases indicated induced erythrocythemia.

Like the “normal” subject(s) before them they experienced increases in their hemoglobin concentration, hematocrit levels, and red blood cell counts. However, unlike, the “normal” subject(s) they required more time to reestablish normocythemia before they could experience a polycythemia. Yet, their mathematical mean values demonstrated a polycythemia had been induced. Gledhill and his colleagues had achieved athletic performance enhancement and defined it as a polycythemia that increased both maximum oxygen consumption and running time to exhaustion for “endurance athletes.”<sup>137</sup>

During the late 1970s and early 1980s Gledhill and his colleagues’ image of endurance athletes coincided with “well-trained” otherwise “normal” males. Using this image, Gledhill and his colleagues normalized normocythemia before and after inducing polycythemia in these athletic male subjects. Simultaneously, they created the “normal” (male) “endurance athlete” blood booster. Like its normal blood boosting counterpart, this entity was a mathematically measured male who experienced performance gains through blood re-infusion. Through Gledhill’s normalizations blood doping began to solidify. Likewise, his normalizations produced blood boosting norms on male bodies, implicitly casting non-male (female) bodies as not normal. (This non-normal casting forms the basis of the following

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<sup>136</sup> Ibid., 636.

<sup>137</sup> It is worth noting these athletes experienced a hematocrit increase which resulted in a hematocrit of less than 50%. At the time there were no cutoff values for hematocrit levels. Now, athletes with hematocrit values over 50% are banned from competition.

chapter.) For now, Gledhill's work positioned male athletes, especially endurance athletes, as distinct from the "normal" male (not normal). Hence, Gledhill provided space for endurance athletes to become more distinct from these males than simply "trained." Although highly gendered this new "normal" male endurance athlete stood as a supernormal alternative to his predecessor type---the otherwise "normal" but trained male endurance athlete of the past. These categorical shifts also make the moral valences of "normal" male and "endurance" male athlete more distinct, thereby enabling blood doping to be seen as an immoral act for one but not the other.

### ***Blood Doping Begins: Technomorality and a Technomedical Entity Solidify in North America.***

In 1987, the American College of Sports Medicine (ACSM) issued their first position statement on blood doping.<sup>138</sup> The ACSM took the position that "the use of blood doping as an ergogenic aid for athletic competition was unethical and unjustifiable, but that autologous RBC infusion was an acceptable procedure to induce erythrocythemia in clinically controlled conditions for the purposes of legitimate scientific inquiry."<sup>139</sup> This position crystalized<sup>140</sup> blood doping's technical and moral terms. Through these certainties technomedical researchers issued their own technomorality of fairness for blood doping that relied on previous researchers' normalizations of "(male) endurance athletes," "athletes," and "normal" males.

In the position statement the ACSM crystalized blood doping in technical terms as either the homologous infusion of approximately 2000 ml of blood or the autologous re-infusion of 900-1800 ml of blood stored via glycerol freezing into an athlete. Further, building off of Gledhill's research they asserted that in the case of autologous re-infusion the athlete must wait until normocythemia is reestablished after

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<sup>138</sup> American College of Sports Medicine, "Position Stand on Blood Doping as an Ergogenic Aid," *Medicine and Science in Sport and Exercise*, 540-543.

<sup>139</sup> *Ibid.*, 540.

<sup>140</sup> I use the term crystalized here to represent the temporary nature of the certainty of "blood doping." In 1996, the ACSM issued a second position statement re-crystalizing "blood doping" to include both autologous re-infusion and the administration of erythropoietin "to artificially increase red blood cell mass." Michael Sawka et al., "Ascm Position Stand: The Use of Blood Doping as an Ergogenic Aid," *Medicine & Science in Sports & Exercise* 28, no. 10 (1996).

the withdrawal of blood. Hence, they suggested this re-infusion usually occurs 24-48 hours before a competition to ensure normocythemia and optimal performance gains.<sup>141</sup> Through the position the ACSM issued and established this technical procedure for blood doping.

In this technical crystalization, the ACSM also introduced new ethical ambivalences. The ACSM explicitly defined blood doping while condemning its practice for athletes. Certainly, this explicit definition allowed athletes to undergo therapeutic medical procedures without being deemed blood dopers. Yet, it also told endurance athletes how to blood dope at a time when detection did not exist; through this detailed definition the ACSM implicitly condoned blood doping.

They also provided technomedical researchers with a space for conducting "scientific inquiry" on blood re-infusion and blood infusion based on the uncertainty surrounding some of the physiological aspects, i.e. some process uncertainty remained. With this the ACSM reintroduced "scientific" and "physiological" ambivalences around blood re-infusion. More re-infusion research could yield more "scientific" and "physiological" certainty.

However, the position made it clear that blood doping was specifically an athletic endeavor---if autologous re-infusion was used by these researchers for clinical studies of physiology in non-athletes or noncompetitive settings then that was not blood doping---subject uncertainty was resolved. Further, they provided criteria for research involving athletes in noncompetitive settings: this "[R]esearch involving induced erythrocythemia should be scheduled approximately 120d (i.e., RBC life span) before an athletic event..." to allow the athletes' body levels to return to pre-infusion states before competing. Although blood doping was now known to confer athletic advantages its mechanism of doing so remained somewhat undetermined and, hence, could be used to justify further work. Further, this timeline allowed athletes to train while blood doping but prevented them from competing when blood doping. By defining blood doping as athletic endeavor immoral in the competitive setting they created an morally and ethically ambivalent space for its use outside of competition.

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<sup>141</sup> "American College of Sports Medicine," *Medicine & Science in Sports & Exercise* 19, no. 5 (1987), 540-541.



While these researchers created physiological ambiguity to justify further studies, they also created response, efficacy, and moral certainty for blood doping in this statement. It no longer straddled the artificial/natural divide of Williams' "physiological ergogenic aid." They positioned blood doping as an artificial process---the "artificial expansion of RBC mass"<sup>142</sup>---rendering it impossible to argue for blood doping's moral ambiguity based on its resemblance to "natural" processes. Henceforth, autologous re-infusion and homologous infusion for athletic gain were deemed "the use of physiological substances in abnormal amounts and with abnormal methods."<sup>143</sup>

Technomedical researchers had acquired more certainty about how blood doping worked within "the body" by the time the position was written. They had determined that "[at] peak exercise, augmented oxygen delivery increases the difference between arterial and venous oxygen concentration [ $C_{(a-v)}O_2$ ] (9, 28, 29, 31). The greater tissue respiration increases  $VO_{2max}$  and endurance capacity."<sup>144</sup> These researchers had resolved some of the process uncertainty of blood doping through their studies.

With technical certainty crystalized, moral certainty also solidified--blood doping was unethical and unjustifiable. These technomedical researchers had confirmed that blood doping could and would produce an "unfair increase of performance in competition."<sup>145</sup> Through the past decade these researchers had technomedically created blood boosting, blood doping, normal blood boosting bodies, and athlete blood doping bodies. Now, in a moment of technomoral crystallization they defined blood doping as unethical and unjustifiable while washing their hands of their own work in creating this moral entity, thereby, moving from an ethics of uncertainty back into an ethics of fairness.

This first position statement represents a shift in the grounds for judging the morality of blood doping---now, blood doping was a technomedical entity to be judged as such:

"[T]echniques to detect an artificially induced erythrocythemia are not available. In addition, if such detection techniques were available, their validity would be confounded

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<sup>142</sup> Ibid., 540.

<sup>143</sup> Ibid., 542.

<sup>144</sup> Ibid., 541.

<sup>145</sup> Ibid., 542.

by altitude acclimatization, hydration status, and normally occurring individual differences in hematocrit.”<sup>146</sup>

With this caveat to the new technomedical blood doping, the ACSM took the position that due to banned status of blood doping, it should be seen as unethical and unjustifiable. Yet, as a technomoral entity there was no way to judge blood doping. Unlike testosterone, amphetamines and anabolic steroids, there were no detection methods available for determining whether an athlete had blood doped or not. Blood doping was a new kind of technomoral entity. Previously, banned substances required a detection method before they were banned and deemed technomedically immoral.

***Conclusion: A Technomedical Entity with No Means of Technomoral Judgement.***

Blood doping took shape and crystalized within sports medicine and physiology from 1973-1987. This crystallization legitimated the claims of endurance athletes and the anti-doping movement that adding more blood to “endurance athletes” could serve as a performance enhancer while marking these “endurance athletes” as potentially transgressive. These researchers normalized “endurance athletes” as distinct from yet similar to “normal” men. These athletes were defined through blood doping research such that they were more likely to have “naturally” higher levels of red blood cells than “normal” people. Yet, this “natural” distinction remained one premised primarily on training during this time-period. That is these researchers saw endurance athletes as trained otherwise “normal,” therefore non-normal, bodies; rather than seeing them as bodies “naturally” predisposed to athletics. As these researchers moved blood doping from uncertain to certain through multiple normalizations---technical, standardizations, subject, and quantitative---”endurance athletes” became figured as potential benefactors and transgressors through blood doping.

This potentially-transgressive “male endurance athlete” emerged out of a distinct technomedical context from other athlete (doper) figures---such as those associated with anabolic androgenic steroid use.

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<sup>146</sup> Ibid., 542.

Here different notions of what counts as “athlete” and enhancement play into the “endurance athlete” than those associated with “power” sports. With this, a distinct form of gender power relations became embedded in the technomedical making of blood doping. These technomedical researchers defined “normal” human and “endurance athlete” as gendered entities. This would have resounding consequences for female athletes as the next chapter will show.

The ACSM position simultaneously produced many certainties while it left open some uncertainty, signaling that the researchers who authored it were committed to operationalizing an ethics of uncertainty to justify research in this morally grey area. Although some uncertainty remained, by 1987 these researchers were paving the way for a technomorality of fairness. That is, their implicit demand for a technical means of detecting and evaluating blood doping (see page 50-51) shifted the social subjective grounds for judging fairness to a technical and technically mediated grounds for judging fairness---the moral character of endurance athletes. These grounds would not be realized for nearly 20 years with the Athletes’ biological passport system. This system would draw on statistical normalizations of various blood “markers” over time to judge athletes.

### **Chapter 3. The Emergence and Ab-Normalization of Female Blood Boosters.<sup>147</sup>**

During the late 1970s and early 1980s, two American physiologists began experimenting with female blood boosting---blood transfusion for increasing the oxygen carrying capacity for athletic performance gain. Their published journal articles demonstrate the processes they used to create the “ab-normalized” female blood booster. This chapter addresses how their knowledge of female athlete bodies, blood transfusion for increasing the oxygen carrying capacity of these bodies, and a particular technomedical ethics of blood doping were co-produced. This co-production cast female bodies and female blood boosters as “ab-normal” in relation to their male counterparts.

“Ab-Normalization” builds off of Foucault’s concept of “normalization” as the construction and internalization of “norms” bound to social or relational exercises of power in specific historical and cultural circumstances. For Foucault normalization involves the creation of “different curves of normality, and the operation of normalization consists in establishing an interplay between these different distributions of normality and [in] acting to bring the most unfavorable in line with the more favorable.”<sup>148</sup> Normalization consists of establishing mathematical ideals or norms of various populations, which then provide the basis for marking sub-populations as “normal,” “non-normal,” and “abnormal.” Normalization creates categorical distinctions between sub-populations with differing power relations. Although some categories may exert more or less power over themselves and others in this relational process there is always room to subvert the power relations and undo seemingly fixed hierarchies, structures, systems, and other relations. These categories are simultaneously moral and ontological, technomedical and biomedical. For Foucault, these categories often emerge in institutional settings, the clinic, prisons, schools, whereas in my work I trace the emergence of these categories with specific technomedical practices and, hence, extend Foucault to these spaces.

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<sup>147</sup> A version of this chapter will be published in the proceedings from the 2012 Gender, Bodies & Technologies Conference.

<sup>148</sup> Michel Foucault, *Security, Territory, Population: Lectures at the College De France, 1977-1978*, ed. Arnold I. Davidson, trans. Graham Burchell (New York: Picador, 2007). 63.

Like “normalization,” “ab-normalization” simultaneously produces the moral and ontological technomedical categories of normal, non-normal, abnormal and deviant while positioning each of these categories in relation each other. Ab-normalization works to police deviance. Abnormal categories are made sense of through their own set of norms in addition to those of the normal category. Ab-normalization creates the abnormal and non-normal distinction just as normalization creates the normal and abnormal distinction. The deviance of the non-normal becomes policeable from these ab-normal/non-normal distinctions. Within blood doping and boosting research, abnormal and non-normal mark distinctions between illegitimate deviance (abnormal) and desired or assumed deviances (non-normal). I use the term ab-normalization to refer to the creation of these categories with “norms” that define the boundaries of each category. In the case of female blood boosters ab-normalization thus captures the simultaneous “normalization” of these blood boosters---data collected from their bodies was transformed into technomedical ideals---and their construction as deviants from the more desired male “norms.”

In this “ab-normalization,” female endurance athletes who stand to benefit from blood doping become enmeshed in two distinct deviant ontological spaces---that of the non-normal females and that of the female endurance athlete who is additionally non-normal. This chapter shows that these female endurance athletes were subjected to seemingly conflicting technomedical ideals of deviance based on gendered expectations of athletic performance. Female elite endurance athletes were expected to outperform “normal” females and some “normal” males. However, they were not expected to outperform all “normal” males or elite male endurance athletes. These expectations are built into the ab-normalization of female endurance athletes. And, at the nexus of gendered expectations and ab-normalization these athletes become (potential) double transgressives,<sup>149</sup> breaking the gender norms and possibly breaking the now technomedically defined moral doping code.

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<sup>149</sup> Anne Balsamo, *Technologies of the Gendered Body: Reading Cyborg Women* (Durham: Duke University Press, 1997), 43. Anne Balsamo also uses the term “double transgressive.” For Balsamo, female bodybuilders double transgress by reconstructing their bodies against naturalized dominant gender ideals and using “technology” defined as bodybuilding to do so. In this paper, I will show that my potentially double transgressive female athletes occupy a somewhat different space. They break the gender norms by being elite athletes and potentially by using blood boosting to achieve more athletic

By highlighting the creation of gender norms with these technomedical practices, “ab-normalization” serves to address a critique of Foucault’s inability to take into account gender in his power analyses. Elizabeth Grosz critiques Foucault for this: “seeing that he rarely discusses female bodies and pleasures, let alone women’s sex and desires; in lieu of any specification, one must presume, along with the rest of patriarchal culture, that the neutral body can only be unambiguously filled in by the male body and men’s pleasures.”<sup>150</sup> In his analysis of small pox, Foucault accounts for the production of ‘deviant normalities’ as part of the normalization within the afflicted population. Yet, the creation of gender ‘normalities’ are not explicitly accounted for, thus demonstrating his inattention to gender differences and power. Ab-normalization explicitly addresses gender and the processes of rendering gendered bodies as part of the articulation of power in the specific historical and cultural moment that brought blood doping into being as a technomedical entity.

Through my exploration of ab-normalization and blood doping’s emergence, I enter into conversation with sports studies and gender studies scholars. Multiple genres of sports studies and gender studies of sport exist. These can be summarized as controversy studies of sport,<sup>151</sup> socialist critiques of sport<sup>152</sup>, gender identity sports studies,<sup>153</sup> masculinity sports studies,<sup>154</sup> and sexuality studies of sport.<sup>155</sup> Recently, Paul Dimeo has introduced to sports studies a technoscientific approach that moves drug use in

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success. Further, Balsamo and I use technological and technomedical in very different ways. For Balsamo, “technological” intervention is done by the athletes on their bodies through training with weight. Whereas, my use of “technomedical” critiques the way the technomedical knowledge of elite endurance athlete female bodies was constructed through blood boosting and blood doping research.

<sup>150</sup> Elizabeth Grosz, *Volatile Bodies: Toward a Corporeal Feminism* (Bloomington: Indiana University Press, 1994). 156.

<sup>151</sup> Jay Coakley, *Sport in Society: Issues & Controversies*, 7 ed. (New York: McGraw-Hill Companies, Inc., 2001).

<sup>152</sup> Garry Whannel, *Culture, Politics, and Sports: Blowing the Whistle, Revisited.*, ed. Jennifer Hargreaves and Ian McDonald, Routledge Critical Studies in Sport (London and New York, NY: Routledge, 2008).

<sup>153</sup> *Sport & Gender Identities: Masculinities, Femininities and Sexualities*, ed. Cara Carmichael Aitchison (New York: Routledge, 2007).

<sup>154</sup> Jim McKay, Michael Messner, and Don Sabo, *Masculinities, Gender Relations, and Sport*, ed. Michael Kimmel, Research on Men and Masculinities Series (Thousand Oaks: Sage Publications, Inc., 2000).

<sup>155</sup> *Sport, Sexualities and Queer/Theory*, ed. Jayne Caldwell (New York: Routledge, 2006).

sport beyond a taken-for-granted morality issue to a product of the modernization of sport.<sup>156</sup> However, Dimeo pays scant attention to gender construction as part of this modernization. Few scholars have taken on the nexus of gender studies and technoscientific studies of drug use in sport. Among these scholars, John Hoberman's work on testosterone stands out as it looks at both gender construction and the technomedical knowledge construction relating to synthetic testosterone use.<sup>157</sup> Like Hoberman, my work examines both the construction of gender and the technomedical knowledge practices that created blood doping and blood boosting.

Since its earliest definition, blood doping has come to describes a range of medical technologies that athletes can use to enhance their endurance performance. These technologies include autologous blood re-infusion, homologous blood transfusions, erythropoietin (EPO-a glycoprotein hormone that triggers red blood cell production), and continuous erythropoietin receptor activators (CERA, the third generation of erythropoietin stimulating agents). When athletes use these technomedical processes to enhance performance it is an unethical act that breaks the rules set by most sports governing agencies. Not long ago, blood doping did not break these rules and was much less resolved technically, as were the bodies that could be blood doped. While these technical and social issues were being resolved, blood doping researchers often deployed the technical uncertainty of blood doping to warrant studying this potential performance enhancing technology.

As charted in the previous chapter, in the late 1970s and early 1980s autologous re-infusion became "blood doping" through the work of many technomedical researchers interested in performance enhancement. Both the technical and the moral issues around blood doping were solidifying. Initially, the technomedical process of blood doping through autologous re-infusion solidified with the bodies of non-athletes (or what researchers referred to as "normal" people) as well as athletes. Almost all of these bodies were male. During the early 1980s American blood doping researchers introduced female bodies to blood

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<sup>156</sup> Paul Dimeo, *A History of Drug Use in Sport 1876-1976: Beyond Good and Evil* (New York: Routledge, 2007).

<sup>157</sup> John Hoberman, *Testosterone Dreams: Rejuvenation, Aphrodisia, Doping*. (Los Angeles, CA: University of California Press, 2005).

re-infusion studies. These female bodies were simultaneously positioned as potential blood dopers and ab-normalized with reference to their “normal” male counterparts. Here I focus on the ab-normalization of female blood dopers to suggest that this participates in the maintenance of a gender hierarchy within sports and anti-doping regulation that often positions women as potential “double transgressors”--- transgressing both the ethical code of sports and the unwritten gender codes<sup>158</sup> of the blood boosting researchers. As blood doping was solidifying in technical and moral terms so too were its gender codes. Ab-normalizations of male and female, athlete and non-athlete, bodies transmitted these gender codes.

**Table 2.** The Relations between the Normal, Non-Normal, and Ab-Normal Categories Created By Blood Boosting and Blood Doping Researchers.

	<b>Normal</b> (not deviant)	<b>Non-Normal</b> (desired or assumed deviance)	<b>Abnormal</b> (illegitimate deviance)
Categories	usually white Western male, untrained, non-athlete	trained, male athlete; untrained female (women) trained, female athlete	non-menstruating females
Blood Boosted Analogues (all deviant)	blood boosting male, non-athlete	blood doped endurance male athlete; blood boosted female non-athlete	blood doped female endurance athlete, blood doped female athlete

***Background: The “Normalization” of Male Blood Dopers.***

Although the previous chapter charts this in more detail, this section serves to highlight how “normalizations” in blood doping research took place especially as they pertain to the later “ab-normalizations” of female blood dopers. Blood doping researchers moved blood doping from technomedical and moral uncertainty to certainty through multiple “normalizations,” which coincided with the creation of “normal” male subjects. During these normalizations, the researchers figured endurance athletes (male and female) as the potential benefactors of blood doping. As stated earlier, these

<sup>158</sup> *Gender Codes: Why Women Are Leaving Computing*, ed. Thomas Misa, Ieee Computer Society (Hoboken: Wiley, 2010)., 8. In Chapter 1, Misa describes “the gendered culture of computing” to explain the gender gap in computer-related fields. I use the term here to signal the gendered nature of the blood research as well as sports. For me, gendered culture, codes, and norms are produced at these multiple levels.



normalizations coincided with ab-normalizations---that is blood boosting researchers simultaneously defined “normal,” “not normal,” and “abnormal.” In the case of blood boosting on male bodies, the “normal” categories were constituted by applying the label “normal” to certain subject groups, employing mathematical normalization processes to render “normal” curves or ideals, and using specific technomedical knowledge practices to establish “normal” bodily conditions. The aggregate of these normalizations were the construction of the “normal” blood boosting male and the “normal” blood doping endurance athlete male. This chapter traces the establishment of relationships between these males and the deviant females in blood boosting and blood doping research.

“Normal” blood boosting males emerged in part through the work of Canadian researchers, Norman Gledhill and F. J. Buick.<sup>159</sup> First, Gledhill and Buick termed their initial 4 subjects “normal” men, thereby initiating a distinction between these men and “highly trained” athlete men. Second, they quantified these “normal” men’s hematological parameters by only expressing them as their mean hemoglobin, hematocrit and red blood cell count value percent changes in comparison with their pre-withdrawal blood values. This mathematical knowledge process created a norm within blood boosting practices: “normal” men “required 5-6 weeks to return to control (hematological) values.”<sup>160</sup>

By determining the hemoglobin and hematocrit levels of their subjects prior to withdrawing blood, which they then froze, these researchers were able to reestablish the subjects’ pre-withdrawal blood levels, or “normocythemia.”<sup>161</sup> After normocythemia was reestablished they re-infused the withdrawn blood into their subjects and saw performance gains. Gledhill and Buick thus established what would be a “normal” bodily precondition for blood boosting and blood doping---normocythemia.

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<sup>159</sup> This “normal” blood boosting male was a non-normal, yet, desired deviant category as such the “normal” blood boosted male was a non-normal category built on the bodies of “normal” men (a normal, non-deviant category).

<sup>160</sup> Norman Gledhill et al., "An Optimal Method of Storing Blood for Blood Boosting," in *Medicine and Science in Sports* (1978), 40.

<sup>161</sup> F. Buick et al., "Double Blind Study of Blood Boosting in Highly Trained Runners," in *Medicine and Science in Sports* (1979), F. Buick et al., "Effect of Induced Erythrocythemia on Aerobic Work Capacity," *Journal of Applied Physiology* 48, no. 4 (1980).

These researchers repeated their technomedical knowledge practices on male endurance athletes, thereby further “ab-normalizing” this category. In other words, they created a new “non-normal” category---a category which was not normal but could be normalized or made sense of through it’s own set of relations to the sub-population norms. The table, on page 46, shows 11 “highly trained runner” male subjects quantitatively normalized in their first study of male endurance athletes. Gledhill and Buick condensed all 11 subjects into a singular “normal” male endurance athlete subject with certain characteristics: a hematocrit of about 46% before withdrawal and re-infusion and a hemoglobin concentration of about 15 grams per 100 milliliters while participating in an endurance run. Unlike the “normal” men of the previous study, these men required more time to return to normocythemia (“avg duration 7.3 wk”<sup>162</sup>). Like “normal” males the blood values of endurance athlete males increased after successful blood boosting and “normocythemia” was upheld as a “normal” precondition to blood boosting with a different time scale for these new non-normal males. Crucially, male endurance athletes underwent similar quantitative normalizations to their “normal” counterparts and although male endurance athletes were not a “normal” category they were normalizable. Male endurance athletes could be understood as having a relation to the “norm” within their own category and as a norm a return to normocythemia was upheld as a requirement for blood boosting. Through the reestablishment of normocythemia, Gledhill and his colleagues had produced the “normal” male endurance athlete for blood boosting and blood doping researchers.

Blood doping researchers constructed numerical “norms” for both “normal” males and male elite endurance athletes.<sup>163</sup> While producing average values that contributed to the construction of normocythemia, the use of specific male bodies became less visible through these average values. Hence,

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<sup>162</sup> F. Buick et al., "Effect of Induced Erythrocythemia on Aerobic Work Capacity," *Journal of Applied Physiology* 48, no. 4 (1980), 637.

<sup>163</sup> Theodore Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1995), 78. Porter discusses the ability of average values to lend credibility to the norms they create while distances these norms creation from the human choices that went into their production. My argument differs from his in that I see these average “norms” based on male bodies was taken-for-granted more so than an intentional choice for many of these researchers. Nonetheless, the average “norms” render specific choices about these subjects and subject pools less visible.

the quantified hemoglobin concentration and hematocrit levels within blood boosting and blood doping seem independent of the studies and male bodies that established them as “norms” and as a necessary precondition for successful blood boosting and blood doping. These researchers rendered “normocythemia” a necessary precondition based on male blood parameters. When attention shifted to female blood boosters and blood dopers, these seemingly value independent gender(ed) norms were also imported.

***The Emergence and Ab-Normalization of Female Blood Boosters.***

*“The effect of induced erythrocythemia on hemoglobin concentration ([Hb]) and aerobic work capacity was determined for nine women.”<sup>164</sup> R. Robertson et al.*

Female subjects initially entered blood doping studies at about the same time as the aforementioned Canadian researchers were resolving the technical practices of blood doping on male bodies by establishing normocythemia as a prerequisite attainable through prolonged glycerol freezing of blood or red blood cell storage.<sup>165</sup> Initial attempts to produce female blood dopers were similar to initial attempts to produce male blood dopers---not enough blood was re-infused and normocythemia was not established prior to re-infusion, resulting in a “failure” to realize female blood dopers. These initial “failures” marked the technomedical researchers’ inability to achieve a doped or performance enhanced bodily state. However, female subjects had emerged as a new subject group for blood boosting and blood doping researchers to ab-normalize. And, hence, these researchers successfully marked females (and female endurance athletes) as potential boosters and dopers---a subjectivity co-produced with the doping technologies.

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<sup>164</sup> Robert Robertson et al., "Hemoglobin Concentration and Aerobic Work Capacity in Women Following Induced Erythrocythemia," *The Journal of Applied Physiology* 57, no. 2 (1984).

<sup>165</sup> Scandinavian researchers had previously used co-ed subject groups in re-infusion studies but they had not been looking specifically to enhance performance outcomes.

Potential female blood boosters and female blood dopers emerged through Russell Pate's work and became ab-normalized through Robert Robertson's research.<sup>166</sup> Could females (and female endurance athletes) even blood dope? And, if so, how? As these two North American exercise physiologists attempted to answer these questions, they also participated in the defining of both "normal" female and "normal" female elite endurance athlete. Both categories were non-normal as they were assumed to deviant from the male "norms." "Normal" females, who I will refer to as "women," were ab-normalized with reference to "normal" men. "Normal" female elite endurance athletes in turn underwent an ab-normalization with reference to "women." Here female blood boosters and dopers emerged as messy subjects enmeshed in technomedical uncertainty and inhabiting bodies with abnormal menstrual blood flows.

After Pate introduced the female endurance athletes to blood doping studies, Robertson's research on female blood boosters and dopers began by discursively marking his subjects as "women," thereby rendering the assumptions of this category less visible. Robertson's use of "women" naturalized biological sex distinctions and valuations of culturally dominant ways of doing gender. He assumed that "women" were physically inferior to their male counterparts because they "naturally" should have less hemoglobin and less of an ability to transport oxygen to working muscle groups during endurance sports.<sup>167</sup> They were destined to underperform next to men.

His ab-normalization continued through quantifying his female subjects' hematological parameters, standardizing their menstrual cycles, defining normocythemia for them, and comparing them

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<sup>166</sup> Pate and Robertson introduced and normalized the female blood doper within North American research. Scandinavians had done some re-infusion studies on female subjects but these studies were not explicitly aimed at achieving ergogenic or performance enhancement. My claim is not that these were the first studies of female re-infusion subject but, rather, that these were the first studies aimed at producing female blood dopers.

<sup>167</sup> Robert Robertson et al., "Hemoglobin Concentration and Aerobic Work Capacity in Women Following Induced Erythrocythemia," *The Journal of Applied Physiology* 57, no. 2 (1984), 572, 573. "When viewed in absolute terms, the postre-infusion Hct and [Hb] of the women were similar to normal prere-infusion values for men of the same age." "As noted earlier, the prere-infusion [Hb] and presumably CaO<sub>2</sub> (arterial oxygen content) were close to the normal levels for males." Both these quotations underline his assumed naturally greater hematocrit, hemoglobin concentration, and arterial oxygen content in males than females. This general assumption leads him to conclude this to hold true for his test subjects without any investigation.

to the male “norms.” Robertson’s work included two coinciding processes: defining both intra-category and inter-category normalizations and deviations, thereby constituting ab-normalizations. These processes rendered the “normal” female, “woman,” within blood doping and blood boosting research. However, from the start this “woman” was also positioned as a deviant normality. Specifically this deviance emerged with the reconstitution of gender norms that ensured females were “naturally” physically inferior to their male counterparts.

### *Female Blood Dopers?*

Russell Pate<sup>168</sup> initiated the first study of this new class of subjects and potential blood dopers in 1979. Pate, an American researcher at the University of South Carolina’s Human Performance Research Laboratory, “designed [his experiment] to observe the effects of blood re-infusion on physiological responses to endurance exercise in females.”<sup>169</sup> Pate sustained these females as a distinct category from their male counterparts suggesting that what is gleaned from male bodies about blood doping may not hold true for these female bodies for they have a “different” physiological composition. Hence, research based on this distinction should be carried out. As Pate introduced uncertainty based on biological sex category distinctions and athletic training, he still relied on previous researchers’ findings on male bodies to derive his expectations for what a successful blood booster should look like: higher  $VO_{2max}$  and Hb. This marks out a trend that would continue to follow female blood doping subjects---they are both made sense of with reference to male blood doping subjects and ab-normalized against these subjects.

Pate’s subjects, “highly trained distance runners,”<sup>170</sup> were placed into either the control group or the experimental group. The experimental group had 450 ml of blood removed (slightly more than 1 unit) and then 21 days later this blood was re-infused. Pate witnessed no significant increase in  $VO_{2max}$  or other

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<sup>168</sup> Received his PhD from the University of Oregon, 1974, in exercise physiology. Pate has “competed in three U.S. Olympic Trials marathons” and was an elite runner during the 1970s and early 1980s. His best finish at the Boston Marathon was a top-ten performance.

<sup>169</sup> R. R. Pate et al., "Effects of Blood Re-Infusion on Endurance Exercise Performance in Female Distance Runners" (paper presented at the Medicine and Science in Sport, 1979)., 97.

<sup>170</sup> Ibid.

physiological parameters after the re-infusion when using a short experimental protocol. He noted that the difference between the control group and the experimental group was negligible. Pate concluded “the specific blood re-infusion procedure employed in this study does not significantly affect Hb [hemoglobin] or physiological response to endurance exercise in female distance runners.”<sup>171</sup> Pate’s work coincided with that of Buick and Gledhill. He was likely unaware of their research on blood storage techniques or the reestablishment of normocythemia as a necessary precondition for successful blood boosting.

In choosing highly trained female subjects and reaching a null conclusion Pate had created technomedical ambiguity for this group---their potential as blood dopers remained unfulfilled. This work simultaneously introduced this “new” female endurance athlete subject group for future studies and provided the technomedical ethical grounds for studying this group. Females and female athletes could and should be studied for they, too, were potential blood boosters and dopers in a way distinct from male blood boosters and dopers. Female and female endurance athlete blood boosters were not yet known to these technomedical researchers.

*Robertson Ab-Normalizes Female Blood Boosting Subjects.*<sup>172</sup>

Robert Robertson,<sup>173</sup> of the Human Energy Research Laboratory at the University of Pittsburgh, took up Pate’s implicit call to determine whether females and female endurance athletes could benefit from blood boosting. Robertson looked at “normal” females, “women,” and accounted for their menstrual flows in his blood boosting research. For blood boosting and blood doping researchers like Robertson, dealing with women’s outward variations in hematological composition presented a new and different set of challenges than those posed by the seemingly hematologically stable “normal” male. Ab-normalization reflects the different strategies used by the researchers on this new body type while creating deviant body

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<sup>171</sup> Ibid.

<sup>172</sup> I want to be clear. I am using the term “ab-normalizes” to mark the process not necessarily the products of this research. Robertson desired to produce blood boosting females, hence, for him these subjects were non-normals not necessarily abnormal.

<sup>173</sup> Robert Robertson, "Robert Robertson," University of Pittsburgh, School of Education, <http://www.education.pitt.edu/people/profile.aspx?f=RobertRobertson>. Received his PhD from the University of Pittsburgh, 1973, in exercise physiology.

norms. This use of ab-normalization thus combines Foucault's normalization work with the work of Emily Martin on the cultural production of women's bodies, and specifically menstruation.

Emily Martin describes the metaphors that contribute to a negative view of menstruation and menopause, which are both linked to failed production or reproduction in a hierarchical information processing system.<sup>174</sup> The Robertson case serves as an example of Martin's claim, although he did not see menstruation as reproductive failure or pathology so much as a process that must be regulated to render women more like "normal"/male humans. Robertson upholds the male body as the normative bodily model. As such, Robertson's ab-normalization represents a much more subtle and insidious gender stratification, one that works to define and control female (and male) bodies through the very ways we culturally produce "normal" bodies and the categories within which these bodies exist.<sup>175</sup>

Robertson labeled his subjects "women" as he established the quantified hematological parameters for this category. "It was also [his] purpose to determine the ergogenic value of induced erythrocythemia in women."<sup>176</sup> In other words, Robertson wanted to determine if females could be blood boosted or blood doped to enhance their endurance sport performances. Robertson's labeling renders both the basis of the pool called "women" and distinctions within this pool invisible while he produced an ideal blood boosted woman. For example, distinctions in the racial and ethnical background of these subjects are erased as are differences in age, weight, height, and fitness levels between the subjects. The label has the effect of making a heterogeneous group of individual female subjects into the homogeneous group "women" while it establishes power relations between this bodily type and others. In this work, the ideal "normal" woman subject hinges on making sense of "women" as a homogenous group which can be represented by an ideal figure.

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<sup>174</sup> Emily Martin, *The Woman in the Body: A Cultural Analysis of Reproduction* (Boston: Beacon Press, 1987).

<sup>175</sup> Again, for me the term ab-normalization is meant to bring specific attention to the power relations of gender and gendering within blood boosting and blood doping research. In the case of female blood dopers or blood boosters technomedical researchers recognized females as non-normal and sought to make sense of them in terms of the normative male body.

<sup>176</sup> Robertson et al., "Hemoglobin Concentration and Aerobic Work Capacity in Women Following Induced Erythrocythemia.", 568.

Robertson's research further rendered several of the characteristics that constituted this category less visible through quantification, such as collapsing their age, height and weight into average values.<sup>177</sup> Although these characteristics were rendered less visible, normal "women" were implicitly defined as young, relatively tall, and slim. He defined normal women, a non-normal category, as having "a regular menstrual cycle (28-32 days)" and the absence of "hematological abnormalities."<sup>178</sup>

The qualification of a regular menstrual cycle is striking for female elite endurance athletes as the potential benefactor of blood boosting techniques. At the time of Robertson's experiment, it was established that many female endurance athletes had severe oligomenorrhea and amenorrhea.<sup>179</sup> Robertson was in effect qualifying elite endurance athletes as abnormal from his "women."

"Normal" women, as such, provided the cornerstone for determining "normocythemia" for blood boosting females. Female elite endurance athletes stood to enhance their athletic performance from this determination since its solidification would ground the terms of female blood doping also. Robertson worked to solidify the reestablishment of "normocythemia" in these women as a precondition for successful performance enhancing blood boosting. However, this reestablishment was not as easy on bodies with deviating blood parameters like those of "women." Further, many female elite endurance athletes were precluded from reaching this condition since their bodies were constructed as ab-normal (and often pathological) by sports physiology researchers.<sup>180</sup>

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<sup>177</sup> "On average, the women were 23±1.8 yr old, were 167±6.8 cm tall, weighed 55.9±4.9 kg, and had a menstrual cycle of 29±1 days." Ibid., 568-569.

<sup>178</sup> Ibid., 569.

<sup>179</sup> Herbert A. deVries, *Physiology of Exercise for Physical Education and Athletics*, 3 ed. (Dubuque, IA: Brown, 1980), 554. deVries references a study which found 23% of nationally ranked long-distance runners did not have regular menstrual cycles.

<sup>180</sup> deVries further suggests that women monitor their menstrual cycles for regularity and that any deviation from the 28-32 day cycle "may be one of the first signs of overtraining" (554).



**Table 3.** Reproduction of Robertson’s Table 1 Hematologic Values for “Women.”

Variable	Pre-phlebotomy	T <sub>1</sub> (Control)	T <sub>2</sub> (Placebo)	T <sub>3</sub> (2 days post)	T <sub>4</sub> (8 days post)	T <sub>5</sub> (14 days post)	P
Hct, %	38.4±3.0	38.1±2.8	38.3±2.1	44.9±2.7	45.0±3.0	44.1±2.9	0.01
[Hb], g/dl	12.7±0.62	12.7±0.58	12.9±0.73	14.7±0.60	14.7±0.59	14.3±0.61	0.01
RBC, ×10 <sup>6</sup> mm <sup>3</sup>	4.16±0.56	4.10±0.51	4.18±0.55	4.69±0.49	4.76±0.54	4.72±0.53	0.03
2,3-DPG, µmol/g Hb	12.6±0.93	12.7±0.88	12.5±0.77	12.6±0.85	12.8±1.00	12.5±0.93	0.83
P <sub>50</sub> , mmHg	28.2±2.32	28.0±2.82	28.5±2.29	27.7±2.62	28.0±2.78	27.4±3/34	0.78
ΔPV, %		-1.14±1.8	-0.37±0.9	-24.5±1.5	-24.64±1.8	-21.23±1.4	0.01

To reestablish normocythemia, Robertson used quantitative methods to ab-normalize his female subjects. Much like Gledhill’s normalization of male subjects, Robertson measured hematological parameters then mathematically averaged these measurements to create one non-normal female ideal. Robertson’s “Table 1,” (my Table 3.) above, graphically represents his quantitative production of this woman within blood boosting research. This woman has a hematocrit value of approximately 38.4% and a hemoglobin concentration of approximately 12.7 grams per deciliter before withdrawal and re-infusion. We can also see at the control and placebo tests that this woman has regained her previous hematocrit and hemoglobin levels, i.e. after a little over 10 weeks normocythemia had been reestablished for this woman.<sup>181</sup> After re-infusion, this average woman experiences an increased hematocrit of ca. 45% and an increase in hemoglobin of ca. 14.7 g/dl.

After re-infusion, this average woman experiences hematocrit and hemoglobin levels similar to that of the trained male athletes before blood boosting (see Image 1). This potential subversion of the dominant gender order receives scant attention from Robertson. Instead, Robertson refocused on the percentage of improvements between the two genders to explain gender disparities. For this ideal woman “the percent of these improvements was somewhat greater than reported by others.”<sup>182</sup> However, the

<sup>181</sup> In 1997 the UCI (Union Cycliste Internationale) established a hematocrit of 50% as the cutoff value for men to participate in events. Women were given a cutoff value of 47%.

<sup>182</sup> Ibid., 573.

percentage of improvement comparison also allowed Robertson to maintain that men given the same percentage of blood would receive the same performance enhancements as his female subjects.

Robertson notes that these women experienced a maximal oxygen carrying capacity similar to that of men with high aerobic fitness. Consistent with what one would expect in a blood boosted male, this woman gained increases in hematocrit, hemoglobin levels, and red blood cell count. These increases marked the blood boosting as successful when coupled to the witnessed performance gains during exercise testing. It seemed as though Robertson had produced *better* blood boosted females than the previous “normal” male subject. And, this better boosted female could pose a challenge to the given gender norm that men should exhibit physical prowess over his female counterpart. However, Robertson did not allow this gender subversion to take place.

Robertson quickly explained that the witnessed “variability in ergogenic response” was likely due to existing sex distinctions in total blood volume, i.e. women have less blood to begin with than men so adding a given volume to women will have a greater effect than adding the same volume of red blood cells to men. According to Robertson, these women were not truly challenging men’s domination in endurance sports it just appeared that way. That they had been given a greater proportion of blood and, hence, experienced greater gains meant that men could also experiences greater gains with more blood. At the time of Robertson’s study this was presumed to be the case and Robertson, himself, presumed this to be true.<sup>183</sup>

Female subjects posed another type of challenge to blood boosting and blood doping researchers; they “naturally” lost blood every month. Robertson had to deal with menstruation, which made these women distinct from the “normal” male subject. Robertson administered his dope testing “within a single menstrual cycle for each subject...to standardize the hematologic changes during menstruation which

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<sup>183</sup> Robertson et al., "Hemoglobin Concentration and Aerobic Work Capacity in Women Following Induced Erythrocythemia.", 573, Robertson suggests that men would experience a greater ergogenic response because men have a higher cardiac output than women and therefore could more effectively push the increased levels of blood to the exercising muscles.

may have confounded the effects of RBC infusion.”<sup>184</sup> Blood was re-infused eight weeks and ten days after the second blood withdrawal. Technically, standardization meant testing female subjects at the same time relative to their individual menstrual cycles.

**Figure 2. Robertson’s Experimental Timetable.**

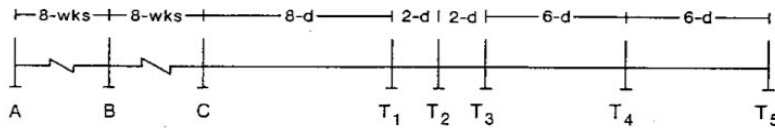


FIG. 1. Schematic of experimental design.

- |                             |   |
|-----------------------------|---|
| A - First Blood Withdrawal  | T <sub>1</sub> - Control Test   |
| B - Second Blood Withdrawal | T <sub>2</sub> - Placebo Test   |
| C - Start of Menstruation   | T <sub>3</sub> , T <sub>4</sub> , T <sub>5</sub> - Post-Reinfusion Test |

T<sub>3</sub> - infusion

Robertson’s figure (above) visually represents when re-infusion occurred relative to menstruation. All test subjects were re-infused with their own blood 12 days after the onset of their second menstrual cycle after their second blood withdrawal. This systematic re-infusion coupled to the regularity of these subjects’ menses has the effect of rendering these female subjects as hematologically equivalent at this time as part of an intra-group standardization process. Not only were they rendered hematologically equivalent to each other but they had also become comparable to men through this standardization. Further, by basing his timeline for the reestablishment of normocythemia off of Gledhill’s work,<sup>185</sup> Robertson enacted Gledhill’s male normalizations on “women.” This had the effect of simultaneously defining the reestablishment of normocythemia for “women” in male terms and marking these “women” as non-normal relative to “normal” males.

Robertson’s wait was based on Gledhill’s study of men and did not explore the possibility of a different optimal timeline for women. Rather, Robertson aligned these women’s menstrual cycles to minimize the hematological changes associated with menstruation. These changes did not go away they

<sup>184</sup> Robertson et al., "Hemoglobin Concentration and Aerobic Work Capacity in Women Following Induced Erythrocythemia.", 569.

<sup>185</sup> Pate used about half as much blood as Robertson and reinfused his subjects after only 21 days. Between the two studies Gledhill and Buick had established that a longer time was required for male subjects to reach normal blood levels, normocythemia, after the withdrawal of 2 units of blood.

were just “standardized” based on a male model of presumed hematological stability. This “normocythemia” premised on the male norm does not reflect menstruating females’ hematological reality---one of ebbs and flows---and constructs a condition for “blood boosting” and “blood doping” that is rarely met in these women’s lives.

Robertson’s menstrual standardization further demarcates non-menstruating women as abnormal women---prepubescent, post-menopausal, or other groups of women with amenorrhea are outside of the category “normal women.” Female elite endurance athletes who exhibit amenorrhea, too, become further abnormalized by this menstrual standardization. They become abnormal not only because they are endurance athletes but also because they can never reach hematological “normalcy” if they exhibit amenorrhea.

Robertson’s standardization portends the androcentric values of the blood doping research community. Male subjects, while subjected to standardizations in terms of training, blood withdrawal and re-infusion were assumed to have constant, i.e. normal, hematological parameters at any given time of the month. Robertson’s study begins to envelope female subjects in a double standardization process within which their hematological parameters were seen as non-normal due to menstruation, but women without menstruation are construed as doubly non-normal and abnormal. In the first part of this process they were subjected to standardizations in terms of menstrual cycle, training, blood withdrawal and re-infusion---an intra-category standardization. The second part of this double standardization process subjected these women to standardization based on “normal,” male hematological parameters, an inter-category standardization. Through this double process both female blood boosters and blood dopers were set at odds with “normal.”

“Normal” women were not and could not be “normal” men--the true standard of blood doping research. From this standardization process, Robertson began to compare their quantified hematological parameters---no longer confounded by their periods these women could be used to determine how to effectively blood boost females, especially when compared to their male counterparts. Robertson also worked from this “standardized” point to reestablish normocythemia. Wanting to prove that blood re-

infusion could also be used to enhance female endurance performance, Robertson's faulty standardization process had the effect of allowing him to draw comparisons between his female subjects and the male norm, but it also potentially truncated the ability of his process to be used by competing athletes who could not or may not have wanted to control their menstrual cycles so carefully before competition. Robertson's normocythemia condition for females was so premised on the male norm that it holds little relevance to competing female endurance athletes.

### *Conclusions.*

Female elite endurance athletes stand at the intersection of two seemingly conflicting technomedical ideals of deviance. According to gender norms constructed within the blood doping and blood boosting research community, they should exhibit more hemoglobin and hematocrit than "women" but if they exhibited too much of either of these blood parameters it could signal now illegal blood doping as defined by the technomedical moral code of this research community. Further, female elite endurance athletes should not surpass "normal" males in terms of their endurance performances for this, too, signaled gender transgression and possible moral transgression. At this intersection it is through the construction of new "norms" based on "non-normal" bodies that these bodies become policeable. In other words, ab-normalization creates a space for policing the "moderately" deviant and "moderate" deviance is desired for elite athletes, male and female. Elite athletes should exhibit this "moderate" deviance and surpass "normal" males and females. However, these technomedical researchers defined the "fair" ways elite endurance athletes should surpass their "normal," non-trained (gender) counterparts.

As these early studies of "how to blood dope" were taking place, researchers such as Robertson were marking out what blood dopers looked like and what gendered blood dopers looked like. They understood these dopers in terms of the "biological" sex categories, i.e. male and female. They further understood male blood dopers to be "normal" blood dopers to which other blood doper types should be compared when measuring the success of technomedical processes. But, female blood dopers who

attained the same levels of hemoglobin concentration or hematocrit levels as their male counterparts could not attain the same anticipated performance gains as the latter.

Robertson's research parlays the previous normalizations that marked male bodies within blood doping research into new ab-normalizations that rely upon ideals of "male" blood to mark female blood boosters as meaningful subjects distinct from their male counterparts. Robertson's ab-normalized female dooper is the culmination of his study. As an average of standardized "women," she looked as much like men as possible while maintaining her "natural" performance inferiorities. Quantification served to further ab-normalize these "women" regarding their male "normal" counterparts. This ab-normalized "natural" inferiority became part of what constitutes "fair" for female elite endurance athletes.

Although Robertson's study suggests the possibility of great improvement for his "women" blood boosters, Robertson forecloses this possibility to maintain the dominant gender order. According to Robertson greater improvement does not really mean better, it means these women began with a lower endurance capacity than their male counterparts. The potential for gender order subversion becomes enmeshed in ab-normalization such that female elite endurance athletes and male elite endurance athletes can both appear non-normal while sustaining male to female gender stratification.

The double transgressive for the female blood dooper or female blood doping endurance athlete is constituted through these renderings of male and female dopers. Here the female dopers run the risk of having too much hemoglobin to compete and to be seen as adequately female much like testosterone doping females. These ab-normalizations in tandem with other hematological studies set the basis for the statistically-oriented testing regimes that sports governing bodies and anti-doping agencies use to determine whether athletes are blood doping. However, more insidiously, these early studies positioned female elite endurance athletes (potential female elite endurance athlete dopers) as other and hematologically inferior to their male counterparts.

#### **Chapter 4. The Morality of Authentic Masculinity: Early Testosterone Use and Detection Techniques.**

From the 1980s to 1990s sports anti-doping researchers developed the initial processes for detecting testosterone use by athletes. During these early years of testosterone detection, testosterone was understood as “the male sex hormone”<sup>186</sup> in the popular imagination while anti-doping researchers were more ambivalent. They often understood testosterone as a hormone produced in both male and female bodies, while nevertheless participating in testosterone’s masculinization. Testosterone, after all, was responsible for virilization of all bodies---a process by which a body is masculinized. Along with its virilizing effects, these researchers believed testosterone conferred an athletic advantage by allowing athletes to gain more muscle mass and to recover from exercise more quickly. Both performance advantages aligned with a hypermasculine<sup>187</sup> model of athletics---the dominant model of masculinity in Western Olympic sport during this time.

This hypermasculine model existed as “stronger, bigger, faster equals better,” with men understood to be naturally stronger, bigger, and faster than women. Many anti-doping researchers, anti-doping policy makers and athletes took the hypermasculine model of athletics for granted. As such the “masculinizing” hormone, testosterone, was linked to both “naturally” better sports performance for men and the understanding that sports performances could be enhanced through synthetic testosterone doping. Therefore, anti-doping researchers had to leave room for the “naturally” testosterone rich athletes while they regulated and punished those who doped with synthetic testosterone.

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<sup>186</sup> Charles D. Kockakian, "History of Anabolic-Androgenic Steroids," *NIDA Res Monogr* 102(1990).

<sup>187</sup> Donald Mosher and Silvan Tomkins, "Scripting the Macho Man: Hypermasculine Socialization and Enculturation," *The Journal of Sex Research* 25, no. 1 (1988). Michael Messner, "The Masculinity of the Governor: Muscle and Compassion in American Politics," *Gender and Society* 21, no. 4 (2007). In the mid-1980s Mosher and his colleague (M. Sirkin) developed “hypermasculinity” as a psychological condition “consisting of: (a) callous sexual attitudes, (b) violence as manly, and (c) danger as exciting” as a way to explain sexual assault and aggression. To me, it’s important to note that hypermasculinity existed as a scientific construct during this time in addition to the hypermasculinity witnessed in popular culture like the Rambo movies. Michael Messner draws on the popular hypermasculinity of this period to present it as hegemonic masculinity during the early and mid 1980s. For Messner, this hypermasculinity recedes due to feminist and popular critiques of popular culture imagery of “man as machine-weapon” and heroic man that encapsulate hypermasculinity for him. Both Mosher and Messner emphasize the physicality of hypermasculinity. For Mosher this physicality is one of action where the challenged “macho”/hypermasculine man reacts to challenges through physical violence. Whereas Messner emphasis is on the musclebound aesthetics of the hypermasculine men.

Before the development of a detection process, testosterone doping was not banned by the International Olympic Committee (IOC), although many journalists, athletes, and sports critics viewed testosterone doping within Olympic sports as immoral. The technical detection process instantiated a new technomoral policy that shifted the authority to make morality claims about testosterone doping from the “public” sphere to the technomedical sphere. With this detection method, these anti-doping researchers made testosterone doping policeable by technomedical researchers. This new policeable technomorality of testosterone emerged and was shaped by challenges to Western white notions of masculinity as well as their hypermasculine model of athletes. That is these researchers participated in an ab-normalization of testosterone and athletes that made both policeable.

These researchers created this new technomorality of testosterone during the 1960s and 1970s when desegregation was continuing the post-Civil Rights Era and this included many sports. Olympic sports in the United States had been integrated since 1912. That team included athletes of African American, Native American, and Hawaiian decent. As others have documented, sport was often used to both justify racism and racial categorization and to rationalize the decline of these categories through integration.<sup>188</sup> Yet, I find bell hooks discussion of black masculinity and hypermasculinity pertinent to this discussion.<sup>189</sup> For when we view sport as a space where racism persists and integration also exists, hooks notion of the “hypermasculine” often out-of-control black male, helps make sense of how this racial power flows in sports where the “hypermasculine” is often a desired trait. This policing allowed for both white and nonwhite hormonal hypermasculinities to be policed. Legitimate hormonal hypermasculinity was ascribed to Western, often white, athletes through “naturally” elevated T/E ratios while it was also policed for these athletes and their nonwhite competitors. Although I largely leave this argument implicit, this new policeable masculinity and hypermasculinity allowed black male athletes to be controlled at a time when many Western white men saw them as out-of-control with violence. Western Black athletic

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<sup>188</sup> Gerald Gem, "Race," in *Encyclopedia of International Sports Studies*, ed. Roger Bartlett, Chris Gratton, and Christer G. Rolf (New York: Routledge, 2010).

<sup>189</sup> bell hooks, *We Real Cool: Black Men and Masculinity* (New York: Routledge, 2004)., 44-62.



hypermasculinity was a potentially legitimate form of hormonal masculinity that also needed to be regulated.

Within the hypermasculine model of athletics, the hypermasculine needed to be regulated as it represented both a desired state for athletes and a potential uncontrolled excess “maleness,” especially its manifestation as hypersexuality and hyperviolence. Anti-doping researchers shaped authentic ways of performing masculinity, femininity, and hypermasculinity for both male and female Olympic athletes through their testosterone detection technologies. Making testosterone regulatable entailed the production of testosterone related hormonal genders, especially masculinity and hypermasculinity. Anti-doping researchers established means of regulating, authenticating, legitimate forms of masculinity and hypermasculinity for athletes. The following traces the production and policing of ab-normalized categories as related to testosterone and endogenous steroid detection by showing how these researchers established these means of authentication. As a process, authentication exists as a form of ab-normalization that these anti-doping researchers do when they produce “authentic,” legitimate and available, hormonal gender states for athletes.

This chapter specifically looks at the use of gas chromatography-mass spectroscopy (GC-MS) and radioimmunoassay (RIA) as these techniques relate to the “testosterone to epitestosterone” (T/E) ratio that came to define testosterone doped athletes. These techniques shifted authentic masculinity from an aesthetic quality usually tethered to male bodies to a matter of hormonal composition in both male and female bodies. Through these techniques anti-doping researchers also established a technical means of evaluating a moral characteristic---doping---as well as a technical moralization of gender. Established through population-based steroid profiles, these techniques aligned with the hypermasculine model of athletes. Both male and female athletes were permitted to have up to six times the “normal” amount of testosterone per biological sex category circulating through their bodies when tested.<sup>190</sup> These researchers defined these athletes as a category of bodies capable of possessing more testosterone than the “normal”

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<sup>190</sup> During this period, the T/E ratio measurement was used on athletes participating in elite national competitions, elite international competitions, and Olympic competitions. The International Olympic Committee initially adopted the T/E threshold than other sports governing bodies followed suit.

population. Again, athletes were understood as non-normal entities. Yet, this non-normality had to be policed at the margins to protect the non-normal from the immoral.

By setting the limits on testosterone high for competing males and female athletes these researchers seemed to inscribe acceptable forms of masculinity and hypermasculinity on both biological sex categories during the 1980s. However, in practice, authentic hormonal hypermasculinity ( $T/E > 6$ ) was often made acceptable for white Western male athletes, thus providing a broad hormonal range for masculinity among male athletes. For female athletes, in contrast, the hormonal detection methods were much more often absolute moral tests that valued their femininity and personal veracity more than their masculinity. The detection methods allowed male athletes to have testosterone/epitestosterone ratios ranging from less than one to six. The confirmation techniques allowed male athletes to “naturally” and without penalty exceed these limits, thereby producing hormonal hypermasculinity. Female athletes who exhibited hormonal hypermasculinity were more often understood as “cheats” or having experienced a temporary testosterone infusion that did not result in performance enhancement.

The following takes a chronological approach to the development of detection techniques for testosterone use in sport. The first section explores the early development of the T/E ratio through GC-MS analysis of “population”-based data. The second section looks at the implementation of the T/E ratio threshold, modifications to the GC-MS technique, and the 1987 ACSM position on anabolic steroid use. The next section illustrates the role of anti-doping researchers’ critiques of the T/E ratio method in shaping additional detection methods for an ever expanding array of “natural” androgenic hormones. Female competitors also presented challenges to this detection technique and the section following details the role of these challenges in the shaping of anti-doping researchers’ hypermasculine model. Each section traces the co-production of authentic masculinity and testosterone detection techniques.

### ***Banning Testosterone: The Early Development of the T/E Ratio.***

Manfred Donike (1933-1995), a West German anti-doping researcher, developed the T/E ratio to catch testosterone dopers. Donike studied chemistry in Cologne and had been a professional cyclist before

becoming an anti-doping researcher. He served as a member of the medical commissions of the IOC and the International Amateur Athletic Federation (Track & Field's governing body). In 1977, Donike became the head of the Institute for Biochemistry at the German Sports University in Cologne; from here Donike launched his crusade against doping in sport. Before becoming the head of the Institute for Biochemistry, Donike worked to determine and evaluate chemical methods suitable for doping detection. Specifically, using gas chromatography-mass spectroscopy he determined a method of detecting metabolites of androgenic anabolic steroids in the urine samples of athletes.<sup>191</sup> At the time of his death in 1995, Don Catlin credited him with devising "all the chemical methods of identifying prohibited substances."<sup>192</sup>

In 1982, Donike and his colleagues put forth a chemical method for detecting testosterone use by Olympic athletes.<sup>193</sup> This method used the GC-MS chemical techniques being deployed to detect other anabolic androgenic steroids. However, rather than a direct measure of synthetic steroid use, this technique relied on an indirect measurement of two endogenous (naturally occurring) substances, testosterone and epitestosterone. This indirect measurement would eventually make room for new kinds of masculinity including hypermasculinity by establishing tolerable levels of testosterone-induced masculinity for athletes. Donike's T/E threshold created a new technomoral regulation of gender through hormonal levels.

Donike and his colleagues thought of testosterone as an "ideal doping substance" because in both men and women it was not directly detectable.<sup>194</sup> Building his detection technique off of previously determined population-based steroid data, Donike demonstrated that testosterone use changed the metabolic rates of both testosterone and epitestosterone such that the "normally" observed 1:1 ratio between these two substances was increased for both men and women. Further, from his own work Donike found that very few Olympic athletes in 1981 and 1982 had a T/E ratio above 5, suggesting that a

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<sup>191</sup> M. Donike, "The Detection of Doping Agents in Blood," *British Journal of Sports Medicine* 10(1976). Donike also worked on finding ways to detect doping agents in blood using gas chromatography-mass spectroscopy.

<sup>192</sup> Philip Hersh, "Sport-Drug Foe Manfred Donike, 61," *Chicago Tribune*, August 22, 1995.

<sup>193</sup> M. Donike et al., "Nachweis Von Exogenem Testosterone/the Detection of Exogenous Testosterone," in *Sport: Leistung Und Gesundheit* (Cologne: Deutscher Azrte-Verlag, 1982).

<sup>194</sup> *Ibid.*, 293.

cutoff of 6 would ensure that only doping positives would be prevented from competition and not those with “naturally” elevated testosterone levels.<sup>195</sup> Donike used athlete urine for his reference population and he assumed these athletes were not already using testosterone. These urine samples were from Olympic samples and West German athletes. The majority of the athletes were white Europeans. Donike’s initial threshold allowed for athletes who might “naturally” experience higher levels of testosterone than the general population. From the beginning, this hypermasculine model of athletics which equates more “male hormone” with better athletes and athletic performances pervaded the testosterone detection methods. In 1982, the IOC-Medical Commission set the testosterone to epitestosterone limit at 6, hence, preventing athletes with a T/E ratio above 6 from competing without further testing.<sup>196</sup>

Although the IOC set the same relative limits for both biological sex categories - a T/E ratio above 6 was the limit for both men and women - Donike seemed to target women’s sports. He suggests that while the T/E ratio approach would not prevent testosterone use or doping, it should curb high testosterone use in women’s sports.<sup>197</sup> By curbing high testosterone levels in female athletes, Donike’s threshold prevented these athletes from attaining hormonal parity with their male counterparts. Specifically, these hormonal levels maintained male dominance in sports and hormonal parity could disrupt that.

Donike’s ratio seems to maintain hypermasculinity as available to both male and female athletes. However, the testing methods used by anti-doping researchers often enacted hypermasculinity as a male hormonal attribute while casting female athletes who passed the ratio cutoff as either or both moral and gender transgressives. The following sections outline how these techniques co-produced a spectrum of racialized hormonal masculinities, including hypermasculinity, for male athletes while often subjecting female athletes to more absolute hormonal genders.

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<sup>195</sup> Donike et al., "Nachweis Von Exogenem Testosterone/the Detection of Exogenous Testosterone.", 298.

<sup>196</sup> Don Catlin et al., "Analytical Chemistry at the Games of the Xxiiiird Olympiad in Los Angeles, 1984," *Clinical Chemistry* 33, no. 2 (1987)., 319.

<sup>197</sup> Donike et al., "Nachweis Von Exogenem Testosterone/the Detection of Exogenous Testosterone.", 298.

***Perpetuating the Hypermasculinity Model through the Analytical Chemistry of Testosterone Detection.***

*“All anabolic steroids misused in sport are chemical modifications of the natural male sex hormone testosterone.” Schänzer 1988, 339.*

After the IOC-Medical Commission set the limit on the T/E ratio at 6, many anti-doping researchers continued to use and modify Donike’s techniques while they often implicitly critiqued steroid use by athletes.<sup>198</sup> These uses, modifications and critiques furthered the hypermasculine model of athletics in tension with the ongoing challenges to white Western masculinity especially around masculinized female bodies in sport.

During the 1980s, these uses, modifications and critiques reached three key phases after Donike’s initial work. First, others used his work to enact the technical, hormonal ratio, definitions of masculinity and testosterone abuse. Second, in 1987 the American College of Sports Medicine presented a new position stand on anabolic androgenic steroid use that had the effects of policing the boundaries of authentic sports performances and the boundaries of authentic masculinity through the hypermasculine model of athletics. Third, anti-doping researchers began to transition away from chemical detection methodologies based on the presence of known anabolic androgenics to chemical methodologies that relied on “steroid profiling” and indirect measurements of endogenous anabolic androgenic steroid use. The following two subsections describe how the first two phases worked to further perpetuate the hypermasculine model as an extension of and response to challenges to white Western masculinity as the dominant sporting masculinity in Olympic sports. The third phase is described in the section that follows. To call these distinct phases is an oversimplification; however, it is one that works to help classify the types of research surrounding testosterone and endogenous androgenic anabolic steroid use detection methods and their chronological development.

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<sup>198</sup> L. Kuokka, A. Leinonen, and K. Kuoppasmi, "Doping Control of Exogenous Testosterone: Detection of Testosterone Esters in Human Blood," (1986). Kuokka et al. worked to develop techniques for testosterone detection in blood because then synthetic testosterone esters (versus naturally occurring testosterone or testosterone metabolites) could be directed detected.

*Enacting Hormonal Masculinity.*

In 1984 at the Los Angeles Olympics, Don H. Catlin (b. June 4, 1938, founder of the 1982 UCLA Olympic Analytical Laboratory) found 5 samples containing a T/E greater than 6 using a modified form of Donike's GC-MS method.<sup>199</sup> His modified detection method relied on Donike's hormonally inflated ratio and, hence, Donike's technically defined hormonal levels where all athletes are permitted to have an excess of testosterone but that excess should not exceed the IOC's permissible threshold. Through his testing Catlin enacted testosterone regulation at the Olympic games for the first time.<sup>200</sup>

Later in the decade, Donike improved his own technique for testosterone detection through high-resolution chromatography, never questioning the original set limit he based largely on a population of Western white athletes.<sup>201</sup> Donike comprised his initial reference population of 2700 athlete urine samples from the Lake Placid and Moscow Olympic Games and 100 West German students (50 male and 50 females) in the early 1980s.<sup>202</sup> Donike established his upper limit based on the 99.9% confidence interval for the high T/E excreting male athletes of his group to prevent "false" positives. He also attempted to lower this limit to 5.3 based on a 99.9% range; however, the IOC did not change the threshold.<sup>203</sup> Regardless, as Donike admitted this, was also a skewed threshold as it likely contained doping positives from the Olympic games' samples. Donike's 1988 work added to this high skewed threshold by taking all the IOC doping definitions for granted and describing screening procedures for each type of banned substance.

Foreshadowing the detection challenges to come, Professor Raymond V. Brooks at St. Thomas' Hospital in London and his colleagues worked to detect testosterone using an alternative method,

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<sup>199</sup> Catlin et al., "Analytical Chemistry at the Games of the Xxiiiird Olympiad in Los Angeles, 1984."

<sup>200</sup> The method had been put to use at the Pan-Am games and European events before this.

<sup>201</sup> Manfred Donike, "Detection of Dope Agents: Nachweis Von Dopingmitteln," *Frensenius Z. Analytical Chemistry* 330(1988)., 337.

<sup>202</sup> M. Donike et al., "Die Normbereiche Fur Tesosteron- Und Epitestosteron-Urinspiegel Sowie Des Testosteron/Epitestosteron Quotienten," *Training and Sport for Prevention and Rehabilitation in The Technized Environment* 27, no. 29 September 1984 (1985)., 505.

<sup>203</sup> *Ibid.*, 507.

radioimmunoassay (RIA).<sup>204</sup> Brooks showed that administration of testosterone in “normal” men resulted in testosterone to epitestosterone increases slightly above the set limit but that the testosterone to luteinizing hormone ratio rose more drastically making it a better indicator of testosterone use. From this he suggested using RIA to catch more testosterone users by monitoring both testosterone to epitestosterone increases and the testosterone to luteinizing hormone (LH) increases.<sup>205</sup> He also rendered an alternative means of authenticating hormonal levels in athletes through the combined use of both ratios.

Brooks assumed that male athletes were otherwise “normal” men thus linking “normal” men and athlete men. This link challenged Donike and the IOC’s assumption of the hormonal hypermasculinity of athletes while it upheld male athletes’ hypermasculine potential. Further, through this Brooks challenged the detection method and its assumption of excess testosterone for athletes. Brooks showed that “normal” men even with a known excess were not detectable dopes, i.e., they did not exhibit the sort of IOC anticipated hormonal hypermasculinity for male athletes even when after using testosterone, using the IOC T/E threshold cutoff. Precisely because these men were “normal” and not athletes this upheld the hypermasculine potential of male athletes. “Normal” men were qualitatively distinct from the athlete male population that might derive its athletic prowess from “natural” levels of excess testosterone. Brooks enacted authentic male athlete hormonal masculinity as a measurement of these two ratios via RIA challenging the previous method while he left the question of authentic hormonal masculinity for female athletes unanswered.

*Policing Boundaries: Sports and Gender.*

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<sup>204</sup> R. V. Brooks, "Application of Immunoassays in Dope Analysis " *ibid.* Brooks developed the initial RIA methods used to detect anabolic androgenic steroids in athletes’ urine at the 1974 Olympic Games. David A. Cowan and Andrew Kicman were colleagues of his at King’s College London around this time.

<sup>205</sup> *Ibid.*, 356.

In 1987 the American College of Sports Medicine issued a new position stand on anabolic androgenic steroid use, replacing their 1977 position stand and acknowledging the performance enhancing effects of anabolic androgenic steroids.<sup>206</sup> The position writers stated, “Anabolic-androgenic steroids in the presence of an adequate diet can contribute to increases in body weight, often in the lean mass compartment” and with this acknowledgement they presented the positive performance effects of anabolic androgenic steroids with their negative health effects.<sup>207</sup> By acknowledging the performance enhancing effects of anabolic androgenic steroids the ACSM position stabilized these hormones as such and they participated in the masculinization of these hormones. As will be discussed, both the performance enhancing and adverse health effects were seen as products of virilization of bodies and as such the ACSM’s presentation worked to bound and produce authentic forms of hormonal masculinity for male and female athletes as related to these effects.

*“Theoretically, anabolic and androgenic effects would be greater in women and children because they have naturally lower levels of androgens than men.”<sup>208</sup>*

Anabolic androgenic steroids are a class of natural and synthetic steroids that mimic the effects of testosterone. The term “androgenic” signals the scientific conviction that these hormones are linked to the development and maintenance of male characteristics and as such these hormones are “properly” understood as “male” hormones. The positive effects, i.e. those that contributed to performance enhancement, increases in lean muscle mass and increases in muscular strength, align with notions of masculinity and the distinctions between men and “non-men” in ways similar to those that Kochakian iterated in his review. Here being male and taking anabolic androgenic steroids to achieve “more” physical masculinity and therefore better sports performance become taken for granted---increases in lean muscle mass and strength result in unquestioned performance gains. Both male and female athletes are

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<sup>206</sup> "American College of Sports Medicine," *Medicine & Science in Sports & Exercise* 19, no. 5 (1987), 534.

<sup>207</sup> Ibid., 534. Shalender Bhasin et al., "The Effects of Supraphysiologic Doses of Testosterone on Muscle Size and Strength in Normal Men," *The New England Journal of Medicine* 335, no. 1 (1996). Ironically, the Sports Medicine community disputed the efficacy of testosterone and other endogenous steroids long after this position was published. In 1996, Bhasin’s work settled the dispute for testosterone for many in this community. Other endogenous steroids’ efficacy as performance enhancers remains disputed.

<sup>208</sup> Ibid., 535.



expected to seek the attainment a sort of physicality associated with masculinity, i.e. more muscle bound, through this construction of the positive effects of anabolic androgenic steroids.

These researchers suggested that muscular strength was likely increased by three mechanisms of action related to the use of anabolic androgenic steroids: increased muscle protein synthesis, blocking the catabolic effects of glucocorticoids, and “steroid-induced enhancement of aggressive behavior.”<sup>209</sup> Increased muscle protein synthesis and blocking the catabolic effects of glucocorticoids had already been shaped as things male bodies did more effectively than female bodies.<sup>210</sup> Thus, the conclusion that an increased amount of “male” hormones in the body rendered these outcomes was not surprising. These researchers understood the two processes as the physical responses to having more circulating “male” hormones while the increased aggression behavior was the psychological response. Although non-male bodies produce testosterone and other “male” hormones these researchers aligned the positive effects of testosterone and testosterone-mimicking hormones with male bodies and masculinity. Likewise, they afforded female bodies and non-adult male bodies more positive effects than their male counterparts. However, as we will soon see the relative abundance of performance enhancing effects for female bodies was balanced by the health risks posed through attaining a hypermasculine hormonal state.

As these researchers outlined the “adverse” health effects they also reflected the entrenched nature of the hypermasculine model and its role in the co-production of the boundaries of authentic masculinity for male and female athletes. Their position included several types of “adverse” effects, I will focus on “reproductive health” effects. The position outlines these “adverse” health effects in terms of male and female reproductive health.

For men anabolic androgenic steroid effects included low sperm count, “decreased testicular size,” and “reductions in testosterone and gonadotropin hormones.”<sup>211</sup> The role of these hormones on

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<sup>209</sup> Ibid., 535.

<sup>210</sup> Increased muscle protein synthesis was understood to both be promoted by androgens and as a necessary precursor to making new muscle whereas catabolic effects are understood to include the process of breaking down muscle proteins.

<sup>211</sup> Ibid., 536.

reproductive health was “ordinarily reversible after cessation of drug treatment.”<sup>212</sup> From this perspective, male athletes were expected to retain their sexual potency while participating in sports. Further, male athletes should either not take or stop taking AAS if and when AAS posed a reproductive health problem.<sup>213</sup> In the ACSM position, athlete males’ sexual potency serves as a countervalance to synthetically induced hormonal masculinity. Through this countervalance authentic masculinity is reproductive masculinity.

The ASCM position describes female athletes’ adverse reproductive health effects to include inhibition of ovulation, inhibition of folliculogenesis, and amenorrhea. This is to say women and female athletes who take steroids risk no longer undergoing the process by which preovulatory cells are produced, the process that renders ovum ready for fertilization, and menstruation. Unlike their male counterparts, these adverse health effects had permanent potential. Whereas sexual potency served as a countervailing force for male athletes taking steroids, female athletes faced a stronger force--the loss of any reproductive future.

However, through their presentation of reproductive risks the ACSM also tacitly granted female athletes a form of acceptance to the hormonally induced non-natural hypermasculinity attained through taking anabolic steroids. This tacit acceptance allowed “non-reproducing” females to take steroids without risk of reproductive adverse effects. Likewise, these “non-reproducing” female athletes were expected to be masculine and masculinized through steroid use. However, the larger point is that for women the adverse health effects extend beyond their competitive reproductive capacity to after their careers have ended. The permanence of these adverse reproductive effects for female athletes is implied but not overtly mentioned. Female athletes’ hormonally induced gender transgressions come with permanent costs---masculinization to their physique such that they may not be able to reproduce.

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<sup>212</sup> Ibid., 536.

<sup>213</sup> Ibid., 536. This could be seen as the ACSM granted male athletes an acceptance to hormonally induced (non-natural) hypermasculinity that comes with the administration of anabolic steroids and implicitly told not to worry about its temporary reproductive effects. These effects dissipate after male athletes stop using anabolic androgenic steroids. Both interpretations uphold male athlete masculinity as the dominant masculinity.

Through their adverse reproductive findings the ACSM's stand also works to perpetuate the hypermasculine model of athletics by devaluing female reproductive health, such that there is no need to discuss the possible irreversible damage of AAS to the female reproductive system. It may be said that the scientific community in the West knew little about these effects but this, too, underscores an assumption by these scientists about these "male" hormones and female athletes' willingness to practice the use of these hormones as their male counterparts did. Importantly, the ACSM's position reflected a belief that female athletes' attainment of a synthetically hormonally induced masculinity comes with a cost--their reproductive femininity. This reflection both devalued female reproduction and promoted the role of the hypermasculine model for female athletes. By positioning female athletes' reproductive femininity at permanent odds with the synthetic hormonal masculinity attained through anabolic androgenic steroid use and tacitly making this hormonal masculinity available to female athletes' (willing to forego child bearing) the ACSM upheld the hypermasculine model of athletes for both male and female athletes. That is the ACSM expected all athletes with higher "male" hormonal levels to perform better although at higher costs for some than others.<sup>214</sup>

Through the ACSM position taking anabolic androgenic steroids comes to represent a non-authentic hormonal masculinity at odds with male athletes' sexual potency and female athletes' reproductive femininity. Yet, this hormonal masculinity confers athletic performance advantage to both male and female athletes. Through the position reproductive health effects become a means of controlling

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<sup>214</sup> The ACSM position also upholds dominant forms of masculinity and hypermasculinity for athletes through its adverse reproductive findings in another way. In the sporting world and under these dominant forms of masculinity and hypermasculinity for athletes, men are expected to father children while competing even if using anabolic androgenic steroids. Female athletes are expected to postpone pregnancy until after competition either during a break from competition or retirement. These gender roles also position females and female athletes as the primary caregivers for children while men are expected to keep working outside of the home. The cost of taking steroids for men is temporary and does not threaten their reproductive capacity nor does their reproductive capacity threaten their athletic capacity. At the same time female athletes' reproductive cost is both lingering and irrelevant. Female athletes who take steroids do so at the risk of losing their sexual femininity. Further their role as the primary caregiver to their children effectively takes them out of competition signaling a loss of their once allowed forms of athletic masculinity. The hypermasculine model of athletics values female athletes' hormonal masculinity over their sexual femininity and valuing male athletes' sexual masculinity along with their hormonal masculinity.

these non-authentic hormonal forms. Tacitly, both male and female athletes are granted space for achieving non-authentic yet more athletic hormonal forms with differing costs to their reproductive selves. Both male and female athletes' authentic hormonal levels were now judged in terms of their reproductive potential also. Somewhat ironically the ACSM position deals very little with actual testing practices for finding athletes using anabolic androgenic steroids.

### ***The Need for Additional Detection Methods.***

After the ACSM's position was updated but not necessarily as a response to this update the fallibility of the T/E ratio as calculated by GC-MS increasingly faced challenges from anti-doping researchers. Athletes increasingly turned to new "endogenous" performance enhancing pharmaceuticals with similar effects to testosterone to evade detection by the T/E ratio.<sup>215</sup> Anti-doping researchers sought new detection methods to catch these alternative forms of testosterone-like doping and sports governing bodies demanded more technical evidence of doping in positive cases. Researchers also knew of male populations outside of the "normal" range in both directions, low testosterone excreters and high T/E ratio excreters. Catching these non-normal male populations when they were using testosterone or testosterone-like substances presented further challenges.

Through these new detection methods new forms of authentic masculinity emerged around testosterone, testosterone-like endogenous hormones, and potential testosterone-use. With the new detection methods there was also a shift to root out more "cheating" athletes while preventing potential "false" positives. Authentic forms of masculinity needed to be available to both male hypermasculine "natural" high T/E excreters and men with normal and low T/E ratios. Anti-doping researchers had to find detection methods capable of authenticating hormonal gender for these "normal" and "low" T/E excreters as well.

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<sup>215</sup> These substances were pharmaceutically produced hormones that also are produced by human bodies. The term endogenous signals the human capacity to produce these hormones.

The following subsections trace three types of challenges to the T/E ratio detection method that arose during the 1990s. First, athletes cheating with other endogenous steroids challenged detection through the T/E method as this cheating often did not exceed the ratio. Anti-doping researchers presented alternative ratios and combined ratio thresholds as better indicators of authentic hormonal masculinity. Second, “non-normal” male hormone excreters challenged the T/E ratio’s capability to detect cheating athletes in these “non-normal” populations. Again, anti-doping researchers presented alternative steroid levels and ratios as indicators of authentic hormonal masculinity. In the case of low testosterone excreters, anti-doping researchers suggested using a longitudinal and subject-based assessment approach foreshadowing the turn in the 2000s toward individual based models of detection, which the next chapter explores. The third challenge arose with implementation of carbon isotope ratio testing. This challenged the adequacy of hormonal levels as indicators of authentic hormonal masculinity.

*The Drug Control Centre moves Testosterone Doping past Testosterone.*

During the 1990s, researchers at the Drug Control Centre in London continued to search for methods capable of catching male athletes using alternative endogenous steroids to boost their testosterone production. This section traces their work. Athletes using these “sophisticated” endogenous steroids evaded detection through the T/E ratio, hence, a new detection method was needed. This challenge to the T/E ratio method of detection also technically expanded the terms of authenticating masculinity to include the use of these other endogenous steroids. Likewise, these researchers technically contracted the boundaries of authentic hormonal masculinity for male athletes through these alternative detection practices even if they were not always adopted by the larger IOC. Authentic hormonal masculinity meant monitoring more than just testosterone and epitestosterone levels for these researchers.

In 1990, Andrew Kicman<sup>216</sup> and his colleagues began to search for a new detection method capable of catching more sophisticated cheating male athletes who either used testosterone and

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<sup>216</sup> Andrew Kicman is the current head of the Drug Control Centre also serving as head during the London Olympics.

epitestosterone together or human chorionic gonadotrophin (hCG) to evade the T/E cutoff values.<sup>217</sup> First, Kicman and his colleagues had to validate their suspicions that these two doping forms left the T/E ratio unaltered. To do this Kicman demonstrated that combined administration of testosterone and epitestosterone resulted in increases in both steroids' urinary excretion rates which when done in the proper, ~28:1, ratio left the T/E ratio relatively unaltered. Likewise, he demonstrated that when men use human chorionic gonadotrophin (hCG) this caused the testicular production of both epitestosterone and testosterone to increase such that the T/E ratio in urine appears unaltered.<sup>218</sup>

Although Kicman and his colleagues did not claim that these two methods of evading detection have performance enhancing effects, they implied that the excess testosterone either administered or produced through these methods resulted in performance enhancing effects, i.e. male athletes who used either method would gain muscle and strength. With this technical implication and Kicman's resultant quest for a detection technique, he expanded the ways in which male athletes could attain unauthentic hormonal hypermasculinity.

Kicman used radio immunoassay (RIA) to detect these two alternative forms of doping and the "old" testosterone administration form. To do this Kicman explains, "repeated injections of testosterone heptanoate at weekly intervals would have a cumulative effect with more complete gonadotrophin suppression and further increases in the T/E and T/LH ratios."<sup>219</sup> Kicman and his colleagues administered testosterone to their subjects and then used radioimmunoassay techniques, like those developed earlier by Brooks et al., to detect the increases in testosterone to luteinizing hormone ratio. Kicman found this ratio was more sensitive to the doping practices described above than the testosterone to epitestosterone ratio.

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<sup>217</sup> A. T. Kicman et al., "Criteria to Indicate Testosterone Administration," *British Journal of Sports Medicine* 24, no. 4 (1990), 253. Jonathan Losos, Kenneth Mason, and Susan Singer, *Biology, Eighth Edition* (New York: McGraw-Hill, 2008), 922, on hCG. Human chorionic gonadotrophin is a hormone primarily excreted during pregnancy for the maintenance of the corpus luteum. HCG's pituitary analogue is luteinizing hormone (LH) which stimulates ovulation in females and works with follicle-stimulating hormone (FSH) to stimulate testosterone production in males. Likewise, hCG can be used to promote ovulation in females and testosterone production in males.

<sup>218</sup> Kicman and his colleagues also contributed to the technical construction of these forms of "sophisticated" doping. I would like to acknowledge this while focusing on how their detection methods worked to form new authentications of hormonal masculinity.

<sup>219</sup> Kicman et al., "Criteria to Indicate Testosterone Administration.", 263.

Further, this ratio provided an indication of testosterone administration even if testosterone is administered with epitestosterone.<sup>220</sup>

Kicman challenged the sort of permissible hormonal hypermasculinity that a T/E cutoff value of 6 allows. He did so by showing that the T/LH ratio when used in combination with the T/E ratio could catch more testosterone users and other endogenous steroid users than when just using the T/E ratio alone. Specifically, through Kicman's combined method male endogenous steroid users with T/E ratios less than 6 could be detected. Kicman still relied on testosterone levels in male bodies although now these testosterone levels were related to luteinizing hormone levels and hCG. With these relations Kicman expanded the range of hormones anti-doping officials and anti-doping researchers needed to monitor to ensure male athletes' authentic hormonal masculinity.

Working in the same laboratory as Kicman, David Cowan<sup>221</sup> and G. J. Southan also sought to prevent the use of endogenous steroids like testosterone stimulating, hCG, and dihydrotestosterone---a "more potent" endogenous steroid than testosterone--doping through new detection techniques. They, too, sought solutions to the challenge of T/E evasion with these alternative endogenous steroids. Both of these researchers began addressing this challenge by demonstrating the ability of their respective hormone to evade detection through the T/E ratio method. Hence, they established a need for alternative testing methods.

First, Cowan began by showing that two healthy male subjects administered hCG did not exceed the T/E ratio threshold.<sup>222</sup> However, these two subjects experienced large increases in urinary testosterone to luteinizing hormone ratios.<sup>223</sup> Cowan, like Kicman, suggested using these large increases in the T/LH

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<sup>220</sup> Ibid., 253. In practice "normal" reference ranges are quite difficult to establish using RIA due to the process of creating immunoassays. Kicman and his colleagues were left recommending this technique as a supplement to positive T/E findings. Regardless, Kicman challenged the model of authenticating hormonal masculinity the T/E ratio entailed.

<sup>221</sup> Cowan serves as the head of research and development for the Drug Control Centre in London.

<sup>222</sup> D. A. Cowan et al., "Effects of the Administration of Human Chorionic Gonadotrophin on Criteria Used to Assess Testosterone Administration in Athletes.," *Journal of Endocrinology* 131(1991)., 147. HCG works to "stimulate testicular steroidogenesis"and prevents testicular atrophy which is often associated with anabolic androgenic steroid use.

<sup>223</sup> Ibid., 151.

ratio to detect hCG administration. Through this Cowan supported Kicman's expansion of the range of androgenic (male) hormones that anti-doping authorities should monitor to ensure male athletes were not gaining a synthetically produced athletic advantage.

At about the same time Southan further technically expanded the range of monitored androgenic hormones. Southan claimed that dihydrotestosterone (DHT) was an active metabolite of testosterone with more potency than testosterone and “a popular DHT derivative (was) used at the Seoul Olympic Games’ that ‘didn’t get tested positive.’”<sup>224</sup> Initially, these claims established a need for a detection method. To produce this detection method Southan studied the effects of DHT administration on six different steroids’ urinary excretion rates much like Kicman and Cowan’s administration studies. To carry out this study Southan administered DHT to two male subjects, one aged 28 and the other 65 years old, and he demonstrated that “the urinary excretion rates of DHT, 3 $\alpha$ -diol and 3 $\beta$ -diol increased when compared to those of T, Epi-T, 5 $\beta$ -diol, and luteinizing hormone (LH).”<sup>225</sup> Critically, Southan found that “the ratios of DHT/LH and 3 $\alpha$ -diol/LH were increased” for his subjects whereas the T/E and T/LH ratios were not increased.<sup>226</sup> From the increased ratios that Southan witnessed he suggested using these alternative ratios and “steroid profiling” as a “screening technique to identify samples worthy of further investigation.”<sup>227</sup> Steroid profiling and monitoring alternative ratios could monitor against the use of DHT.

Southan’s steroid profiling of six hormones and four ratios foreshadowed the steroid profiling the World Anti-Doping Agency would later use as a secondary means of authenticating athletes’ hormonal levels. Yet, even in this nascent form Southan’s steroid profiling marked an increase in monitored hormones. With this increase authentic masculinity was marked by the measurement of more hormones. As steroid profiling evolved to include changes to steroidal excretion rates over time in the coming decade, authentic hormonal genders would replace authentic hormonal masculinity as described in the following chapter. Southan and the others at the London Drug Centre determined that more hormones

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<sup>224</sup> G. T. Southan et al., "Possible Indices for the Detection of the Administration of Dihydrotestosterone to Athletes," *Journal of Steroid Biochemistry: Molecular Biology* 42, no. 1 (1992), 87, 93.

<sup>225</sup> *Ibid.*, 87

<sup>226</sup> *Ibid.*, 93.

<sup>227</sup> *Ibid.*, 94.



were capable of promoting testosterone production and found more potential detection methods for these hormones effectively refining the technical terms of authentic hormonal masculinity.

Collectively Kicman, Cowan, and Southan worked to find new ways to catch male athletes using a range of endogenous steroids to promote testosterone production. Guided by a stated desire to catch doping cheats who evaded the T/E cutoff method, these researchers challenged the authenticity of the testosterone induced hypermasculinity allowed by the T/E cutoff value along with challenging the value as a measure of authentic hormonal masculinity. They also expanded endogenous androgenic doping to include a range of hormones beyond testosterone. With this expansion the King's College researchers expanded and contracted the forms of hormonally authentic masculinity available to male athletes. For them "authentic" masculinity *for male athletes* was increasingly composed of a series of androgenic steroid excretion rates and ratios as opposed to the singular T/E ratio. The T/E cutoff ratio remained the first means of evaluating authentic masculinity and possible authentic hypermasculinity for IOC sports competitors; however, studies challenging the cutoff value and its forms of masculinity and hypermasculinity were accumulating.

*Preventing False Results for Natural Male Outliers: Low Excreters.*

During the 1980s anti-doping researchers became aware of male athletes who excreted low levels of either testosterone or epitestosterone and these athletes presented challenges to testosterone use detection based on the T/E ratio threshold and its form of authentic hormonal masculinity. During the 1990s anti-doping researchers worked to resolve these challenges. On the high side of the T/E ratio spectrum, Kjell Carlström<sup>228</sup> and his colleagues sought to prevent false positive claims and protect male athletes with naturally elevated T/E ratios. Carlström and his colleagues found "in a few subjects...constantly above-normal urinary testosterone/epitestosterone ratios that [were] unlikely related

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<sup>228</sup> Kjell Carlström worked with other Swedish and Norwegian anti-doping experts during the period this paper was published. He was located in both the Department of Obstetrics and Gynecology and the Karolinska Institutet then. Coincidentally, there is also a professional cyclist by the same name. However, the cyclist is Finnish.

to exogenous testosterone administration.”<sup>229</sup> Rather, Carlström and his colleagues contended that low epitestosterone levels lead to these subjects’ high T/E ratios. Carlström and his colleagues worked in Sweden and Norway both countries with large white racial majorities, and their above normal males likely came from this majority group.<sup>230</sup> These above normal males challenged the T/E ratio test. Since they always tested above the ratio cutoff it could not ensure these above normal men presented a hormonally authentic masculinity.

To resolve the challenge presented by these above normal males Carlström and his colleagues initiated a study to determine an alternative testosterone detection method. Carlström and his colleagues studied seven healthy male volunteers before, during and after receiving an intramuscular injection of testosterone-enthalate. They monitored the subjects’ serum and urinary testosterone, 17- $\alpha$ -Hydroprogesterone (17OHP), and luteinizing hormone (LH) levels as well as the ratios of T/LH and T/17OHP.<sup>231</sup> They then compared these monitored values to those of their reference range. Their reference values were obtained from 21-60 “healthy, sedentary men”<sup>232</sup> and reference data from 15 ice hockey players and 20 male spectators to study the diurnal variation of 17OHP. Using these various reference values, Carlström and his colleagues determined that the “serum T/17OHP ratio was the best marker of those tested, with all seven subjects having above-normal values for this in the first 3 days of the observation period.”<sup>233</sup> Further, they contended that by using this ratio male athletes with a “naturally” elevated T/E value would not be subjected to false positive claims.<sup>234</sup>

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<sup>229</sup> Kjell Carlström et al., "Detection of Testosterone Administration by Increased Ratio between Serum Concentrations of Testosterone and 17-Alpha-Hydroxyprogesterone.," *Clinical Chemistry* 38, no. 9 (1992)., 1779.

<sup>230</sup> Carlstrom and his colleagues do not specify the racial, ethnic, or geographic make up of either the above normal group or their other groups. I take this lack of specification to signal a “mono-racial” composition of white men which the researchers saws as subjects who need not be specified. I also use the term race, white, and racial hesitantly and acknowledge these terms as laden with values specific to the circumstances of their use. However, the point here is that these researchers used an unmarked category likely comprised of white Scandinavian men to build an authentic form of hormonal hypermasculinity and limit this hypermasculinity in sport.

<sup>231</sup> Ibid., 1779.

<sup>232</sup> Ibid., 1780.

<sup>233</sup> Ibid., 1779.

<sup>234</sup> Ibid., 1779.

Like the London Drug Centre Carlström and his colleagues work shifted the burden of authenticating masculinity for male athletes from the T/E ratio to another ratio, the T/17OHP ratio. He also attempted to shift it from urine samples to blood samples. However, the T/17OHP ratio and serum tests were not adopted by the IOC as a means of testosterone dope detection. Despite this his work still challenged hormonal authentic masculinity as adjudicated by the T/E cutoff value by presenting low epitestosterone excreting males as a hormonally authentic (although perhaps not normal) masculinity type available for male athletes.<sup>235</sup> Carlström and others claimed the “naturally” elevated T/E values arise from low epitestosterone production and normal testosterone production. Hence, in theoretical terms they created a space for high T/E excreters who were low E excreters not high T excreters. However, in practice this distinction was more difficult to make when monitoring the T/E ratio alone. Regardless, Carlström and his colleagues helped cement the “naturally high T/E excreter” as a sub-population of male athletes and validate this sub-population as an authentic form of hormonal (hyper)masculinity which also needed to be monitored differently than normal T/E excreters.

Another set of anti-doping researchers challenged the adequacy of T/E for detecting testosterone dopers in a male athlete sub-population at the low end of the T/E ratio spectrum. Their work began with Xavier De La Torre<sup>236</sup> et al. determining a means of testosterone detection in two ethnic populations---Spaniards (Caucasians) and Chinese (Han) men.<sup>237</sup> They found that six out of the eight Han men have “very low basal values of the [T/E] ratio (in agreement with the expected population distribution of Orientals).”<sup>238</sup> De la Torre was not the first to make such a finding. De la Torre and his colleagues

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<sup>235</sup> Given the size of the entire subject pool (63-102 male subjects) had they found a single “natural” high T/E individual this would suggest that these individual (males) were not outliers. They did not find any high T/E individuals in their study but they still maintained this as a “natural” possibility (especially) for male athletes.

<sup>236</sup> Xavier De La Torre was working with Spanish anti-doping experts when he published this paper. He is currently serving as the Scientific Vice Director for the Italian Anti-Doping Laboratory in Rome.

<sup>237</sup> Ethnic is the term that De La Torre uses to describe these two populations. While it is perhaps better than race, I use this term hesitantly and acknowledge their use of the term as imprecise. This imprecision often has the effect of re-creating the researchers’ own ethnic (or racial) category as the “normal” and dominant category as in the De La Torre case.

<sup>238</sup> X. De La Torre et al., "Testosterone Detection in Different Ethnic Groups" (paper presented at the Recent Advances in Doping Analysis, Cologne, Germany, 1997).

confirmed the existence of low testosterone excreting (Asian) men, thereby marking another non-normal male population. These low testosterone excreters also challenged the validity of the T/E ratio cutoff. As a measure of authentic hormonal masculinity as the next paragraph explains, they could evade detection through this method while using testosterone.

To demonstrate the possibility of detection evasion De La Torre and his colleagues administered testosterone to these two groups of men and found significant differences in the pharmacokinetics between the two groups. In particular, the Chinese men never attained a T/E value over 6 and such a T/E below 6 allowed low testosterone excreting men to use more testosterone than “normal” testosterone excreting men. De La Torre and his colleagues suggested using individual longitudinal studies to monitor this form of masculinity instead of using Caucasian-based reference range limits, i.e.  $T/E > 6$ . However, the T/E cutoff value remained in effect.<sup>239</sup> By adhering to the T/E threshold after De La Torre’s findings and others like him, the IOC implicitly defined these low testosterone excreting sub-populations as a hormonally inferior masculinity to their white counterparts. Taking testosterone to achieve “normal” levels seemed to present no threat to international “fair play” for these low testosterone excreters.

Together De La Torre’s findings and the use of the T/E ratio perpetuated the dominance of white Western men and male athletes as the referent “normal” testosterone excreter and metabolizer which in turn also produced white Western hormonal masculinity as the dominant and “normal” masculinity for these researchers. Asian (Ethnic Han) men remained lesser hormonally speaking, than their white Western counterparts and this was measurable by the amount of testosterone they excreted and how they metabolized it. Further, the perpetuation of Asian men as hormonally lesser combined with the continued use of the T/E ratio cutoff value to allow these men to administer testosterone. Unlike, white Western men, administering too much testosterone did not present a problem (non-authentic athletic

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<sup>239</sup> During the early 2000s, the T/E cut off value was lowered to 4:1. However, the T/E cutoff value largely remains the primary means of determining whether an athlete has used testosterone or testosterone stimulating drugs to enhance performance.

hypermasculinity) for these men.<sup>240</sup> Rather, for these men taking testosterone merely made them more “normal” when compared to their white counterparts. White western men, as Carlström shows, were expected to be “normal” testosterone excreters or above normal excreters; as such, their hormonal hypermasculinity posed a threat if left unregulated. Their excess hormonal masculinity if unauthentic, a performance enhancing masculinity, threatened “fair play” amongst international male athletes.

For these researchers the hormonal masculinity embodied in an individual’s hormone parameters, like T/E or T/LH, was an inadequate measure of authentic sporting masculinity and they shifted to finding parameters suitable for judging entire non-normal sub-populations who could evade detection through the previously defined T/E ratio. Simultaneously, these researchers’ work upheld the hormonally defined masculinity and hypermasculinity as enacted by the T/E cutoff value while they created a range of hormonal masculinities through their alternative detection methods. This range of hormonal masculinities challenged the validity of the T/E cutoff ratio as a measure of testosterone and endogenous steroid administration as well as the subsequent authentication of male athletes’ hormonal masculinity.

*Testosterone Detection Moving from Hormones to Carbon Isotopes.*

Rodrigo Aguilera<sup>241</sup> and his colleagues challenged the T/E ratio as an authenticator of hormonal masculinity in a different way and they challenged the adequacy of hormonal ratios as indicators of

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<sup>240</sup> C. Schweizer et al., "T/E Ratio Variations through Puberty in Male Adolescents" (paper presented at the Recent Advances In Doping Analysis (4), Cologne, Germany, 1997). Ethnic Hans were not the only unwieldy male athlete population---male adolescent athletes also presented challenges to the T/E ratio cutoff as a measure of testosterone doping. Schweizer and colleagues studied the steroid excretion rates of many steroids in 100 male athletes aged 10-17. These researchers sought to establish reference ranges for this alternative athletic masculinity and to determine if some members of this group would exceed the T/E cutoff without doping. They found some subjects did exhibit a near six T/E value and these subjects had higher variation in their values due to low epitestosterone excretion and lower concentrations of testosterone.<sup>46</sup> Although the T/E cutoff value remained of questionable importance for detection testosterone doping in this group, male adolescent athletes had become an additional form of masculinity to be monitored by anti-testosterone authorities. Adult masculinity retained its status as the most acceptable authentic form that is capable of “naturally” attaining hypermasculinity.

<sup>241</sup> Rodrigo Aguilera is the head of and Scientific Director of the Portuguese Anti-Doping Laboratory in Lisbon.

doping transgressions altogether. Further, they presented a solution which turned to the elemental composition of endogenous hormones, both androgenic and non-androgenic, to authenticate hormonal masculinity.<sup>242</sup> Aguilera and his colleagues reached deeper within athletes' excretory make-up to detect testosterone users as their work shifted detection measurements from "normal" and authenticated hormonal levels to "normal" carbon isotope values within a range of excreted hormones and hormonal metabolites.<sup>243</sup> In the following section, I trace how Aguilera's work represents an attempt to redefine the terms of authenticating hormonal masculinity by developing detection techniques that used gas chromatography-combustion-isotope ratio mass spectroscopy (GC-C-IRMS). During this development Aguilera and his colleagues also presented solutions to the demands for more technical evidence of testosterone and endogenous androgenic steroid doping as well as to the challenges of "non-normal" male athletes using other endogenous steroids to evade detection by the T/E ratio.

Working with the urine samples from an experiment on the effects of testosterone on male behavior, Aguilera established that testosterone administration affects the carbon isotope ratio.<sup>244</sup> This ratio measures the relative abundance of carbon-12 and carbon-13, both naturally occurring isotopes, in specified chemical compounds. In this initial study Aguilera and his colleagues remained tentative in their proclamations, recognizing "gender, ethnicity and diet" affected the carbon isotope ratio. Due to this

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<sup>242</sup> Rodrigo Aguilera et al., "Improved Method of Detection of Testosterone Abuse by Gas Chromatography/Combustion/Isotope Ratio Mass Spectroscopy Analysis of Urinary Steroids," *Journal of Mass Spectrometry* 31(1996)., 170.

<sup>243</sup> I want to be absolutely clear, the T/E ratio still acts as the primary measure of testosterone doping. However, the additional verifying measures like the carbon isotope measurement did entail shifts in the process and product of authentic (once hormonal) masculinity. Other researchers like S. Horning were also working on carbon isotope detection methods at the same time as Aguilera. S. Horning et al., "Detection of Exogenous Testosterone by 13c/12c Analysis" (paper presented at the Recent Advances in Doping Analysis (4), Cologne, Germany, 1997)., 282. Horning and colleagues also saw possibility in the monitoring of carbon isotopes to determine which male athletes were using testosterone to create an unnatural advantage over their non-doping counterparts. Horning administered testosterone to two men to determine the excretion rates and make carbon isotope ratio measurements over time---i.e. to affirm the feasibility of using carbon isotope ratios to detect testosterone doping. They found after only 4 hours the T/E ratio had returned to sub 6 values but the change in carbon-13 remained elevated. They suggested using isotopic detection as part of routine screening because it seemed to be far more sensitive to these synthetic bolstering of athletic performance

<sup>244</sup> Aguilera et al., "Improved Method of Detection of Testosterone Abuse by Gas Chromatography/Combustion/Isotope Ratio Mass Spectroscopy Analysis of Urinary Steroids."

recognition they suggested using carbon isotope mass spectroscopy as a supplemental test when the T/E ratio exceeds the cutoff value instead of suggesting this technique supplant the T/E ratio method.<sup>245</sup>

Regardless, Aguilera's work expanded the terms by which masculinity was potentially authenticated for male athletes and this expansion allowed for detection of use such that previously defined "authentic" hormonal masculinities, like the low E excreters, could be reevaluated and potentially re-labelled. Aguilera and his colleagues presented carbon isotope values as means to reevaluate and re-label low E excreters. To do this they initially relied on their previous research that demonstrated lower isotopic values for testosterone after testosterone administration.<sup>246</sup> Their 1996 study worked to improve the GC-C-IRMS method by measuring the carbon isotope values of testosterone, two testosterone precursors, and two testosterone metabolites over the course of a testosterone administration study in eight healthy male subjects.<sup>247</sup>

During this study urine samples were collected before, during and after testosterone administration. Aguilera and his colleagues then used GC-C-IRMS to evaluate these 25 samples. Those performing the evaluation were unaware of the subjects' testosterone administration status or the subjects' T/E ratio. They found 10 samples with decreased <sup>13</sup>C values for both testosterone acetate and testosterone metabolites and concluded these were the testosterone users, due to this drop in <sup>13</sup>C values. Later, the researchers confirmed this using discriminant analysis and the T/E ratio method.<sup>248</sup> This confirmation demonstrated the viability of GC-C-IRMS for detecting testosterone users.

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<sup>245</sup> During the 2000s the carbon isotope approach would be used as an alternative and confirming means of catching testosterone and endogenous steroid users. This is discussed more in the following chapter. The following chapter details the challenges GC-C-IRMS detection presented for these anti-doping researchers after the World Anti-Doping Agency implemented it as a means of technical evidence of testosterone doping. For now, it is enough to say Aguilera's GC-C-IRMS detection challenged the efficacy of the T/E ratio while presenting an alternative technique for finding testosterone users.

<sup>246</sup> M. Becchi et al., "Gas Chromatography/Combustion/Isotope-Ratio Mass Spectrometry Analysis of Urinary Steroids to Detect Misuse of Testosterone in Sport.," *Rapid Communications in Mass Spectrometry* 8(1994).

<sup>247</sup> Rodrigo Aguilera et al., "Improved Method of Detection of Testosterone Abuse by Gas Chromatography/Combustion/Isotope Ratio Mass Spectroscopy Analysis of Urinary Steroids," *Journal of Mass Spectrometry* 31(1996)., 169.

<sup>248</sup> *Ibid.*, 174.

Aguilera was concerned about the possibility of male subjects with naturally elevated T/E ratios being subjected to false accusations of testosterone use, hence, he proposed the GC-C-IRMS method could “discriminate between subjects with naturally elevated T/E and subjects having taken T.”<sup>249</sup> To do this required knowledge of a subjects’ “gender, ethnicity and diet” baseline values or their own baseline <sup>13</sup>C values which could then be compared to the values of their excreted testosterone, its precursors and metabolites as he had. Aguilera even reported the previously observed baseline values for North Americans, Western Europeans, and South Africans to aid those using this method.

Aguilera and his colleagues premised their research on the belief that pharmaceutical testosterone’s <sup>13</sup>C values would always fall outside of the baseline ranges such that comparison between the baseline range and individual values would discriminate between users and non-users.<sup>250</sup> Hence, this discrimination provided an alternative method for evaluating a subjects’ hormonal masculinity.

Carbon isotope ratios shifted the metrics for measuring and regulating hormonal masculinity from a strictly hormonal model to a mixed biological-cultural model within which the anti-doping researchers had to account for food intake and other cultural variables. This shift also entailed bio-cultural pluralization of masculinity for male athletes by allowing the high T/E excreter more legitimacy as an authentic form. It did not necessarily entail a shift in the dominance of white adult Western masculinity for the anti-doping researchers, especially given that the T/E ratio remained the primary measurement for authenticating hormonal masculinity. Aguilera upheld the white Western male’s dominance in this preliminary mode by defending the high T/E ratio shielding this male sub-population from claims of testosterone doping. This sub-population was largely composed of white Western male athletes.

### ***Women, Testosterone and the Detection Limit.***

With the T/E ratio cutoff at 6 it seemed that the International Olympic Committee (IOC) enacted a range of permissible hormonal masculinities that exceeded those of the “normal” female population and

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<sup>249</sup> Ibid., 174.

<sup>250</sup> Ibid., 174.



the general female athlete population. The anti-doping researchers consistently demonstrated that both had T/E values near 1. Under the IOC enactment these anti-doping researchers often carved niches--- made new authentic forms of hormonal masculinities----for “naturally” high and low testosterone excreting male athletes. However, they often did not grant female athletes the same seemingly unambiguous “natural” status. Rather, female athletes’ high testosterone excretion challenged their femininity and whether hormonal hypermasculinity, i.e. testosterone excretion above a T/E of 6, should be available to female athletes.

As anti-doping researchers sought supplemental and optimized detection methods for catching male cheats, female athletes tested the detection limits. Literally, the quantities of testosterone in non-doping female athletes’ urine samples were so low they approached the physical detection limits of the Gas Chromatograph-Mass Spectroscopy (GC-MS) method. Although many researchers made note of this detection limitation, very few studies of women and testosterone detection were undertaken by these researchers. The few undertaken wrestled with the challenges presented by female athletes’ excretion of testosterone in a couple different ways: suggesting using alternative ratios to evaluate female athletes and using longitudinal studies of individual athletes. These two ways served to both subvert and reinforce the hormonal masculinity limits defined by the T/E ratio cutoff value.

Yet, it seems no anti-doping researcher (outside of the GDR) undertook testosterone administration studies in female subjects or female athletes to devise a testing method more calibrated to the difficulties presented by the female body. As you will recall, many of the aforementioned studies used males and male athletes who received testosterone or other endogenous androgenic steroids to devise detection techniques. Rather, these Western researchers coinciding studies of female bodies attended more to the limits of femininity and masculinity available to female athletes. They assumed that women should have little testosterone which limited the range of authentic hormonal masculinities available to female athletes.

These anti-doping researchers contributed to the construction of distinctions between males and females and male and female athletes by producing authentic, non-cheating, forms of testosterone laden

masculinity for both male and female athletes. Particularly, through the detection limits of testosterone in female bodies these researchers enacted an absolute hormonally authentic form of masculinity for female athletes and this absolute was often related to the simultaneous maintenance of their femininity. Whereas these researchers enacted a range of authentic and permissible masculinities for men including authentic hormonal competing hypermasculinity for male athletes through the T/E cutoff value and detection techniques.

Regulating the authentic forms of testosterone-induced masculinity for female athletes while maintaining their femininity presented new challenges to anti-doping researchers. These challenges included: female athletes did not seem to have stable testosterone to epitestosterone ratios due to their low testosterone excretion; female athletes' urine was subject to bacterial contamination; their hormonal excretion rates were affected by alcohol consumption, they were known to be subject to hormonal flux through their menstrual cycle; and they took oral contraceptives which effected their hormones. Further, it was questionable whether female athletes should be capable of possessing any authentic forms of masculinity. The following cases, although far from exhaustive, represent a myriad of challenges that researchers faced when dealing with female athletes and the limitations of detection.

Anti-doping researchers often maintained female athletes' femininity in specific instances of T/E ratio transgression where the athlete in question was not believed to be a testosterone user. The first two cases in this section describe this maintenance of femininity in two female athletes' specific cases. Each of the cases also created new means for testing and authenticating female athletes' T/E excretion rates. As you will recall from the previous sections, male athletes who were not believed to be cheating with testosterone were often assumed to be "natural" high T/E excreters and granted this authentic form of hypermasculinity. In the case of the first two female athletes the (gendered) role of personal veracity in establishing the domain of testosterone cheating emerges as a means of authentication which the researchers themselves work to uphold through their studies. Under this model of personal veracity, new technoscientific explanations for high T/E excretion are necessary. These new explanations worked to maintain the female athlete's femininity in the face of a suspected hormone induced gender transgression.

The second two cases present studies of detection that created more female norms for testosterone detection. These two cases deal with “women specific” issues, menstruation and oral contraceptive use, and their effects on women’s steroid profiles, especially the T/E ratio. These two cases also implicitly render females and female athletes as non-normal types that require their own “sub-population” testing. The anti-doping researchers presented technomoral solutions to these challenges that co-produced forms of authentic gender for female athletes, at times maintaining femininity and at times authenticating hormonal forms of masculinity for these athletes.

*Bacterial Contamination and Hyperelevated Female T/E Ratios.*

In 1995, Diane Modahl (b. June 17, 1966, Manchester, United Kingdom), a British middle distance runner, won an appeal against a four-year ban she received after her urine sample revealed an elevated T/E ratio.<sup>251</sup> Modahl tested above the T/E cutoff value. Unlike her male athlete counterparts Modahl could not claim a “naturally” elevated T/E ratio and instead she simply claimed she had not used testosterone. This was due to the nature of the detection method and the assumed low levels of testosterone in women. Rather, her appeals’ team looked to alternative plausible explanations for her purported hormonal masculinity transgression. The experts, Professor Arnold Beckett (1920-2010) and Dr. David Cowan (cofounder of the Drug Control Centre at King’s College), suggested that Modahl’s urine sample had been improperly stored and handled which resulted in bacterial contamination.<sup>252</sup> They

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<sup>251</sup> Andy Clarke and Keith Clarke, ""About Diane." Diane Modahl Sports Foundation," J. Wood Creative, <http://dmsf.co.uk/about-us/about-diane/>. Diane Modahl was one of the UK’s most successful 800m runners. She competed in four Olympics and medalled in many Commonwealth Games. She now heads a charitable foundation for youth sports in the UK. Mike Rowbottom, "Modahl Ruling Casts Doubt on Drug Tests," *The Independent*, July 27, 1995. Modahl’s T/E ratio was measured at 42:1 “nearly four times the level in Ben Johnson’s sample which led to his life ban.” Modahl’s T/E was much higher than previous doping positive cases.

<sup>252</sup> Ibid. Arnold Beckett and David Cowan were/are British sports drug testing researchers. Cowan as mentioned previously worked on anti-testosterone and anti-anabolic steroid test detection methods. Cowan remains the director of the Drug Control Centre at King’s College. To be clear improper storage could also produce this effect in male athletes’ urine.

concluded “that if urine is degraded by bacterial action, it is possible for the [testosterone:epitestosterone] level to be raised.”<sup>253</sup>

Critically, although Modahl’s ratio was raised, the concentration of the main metabolites of testosterone in her urine remained low, marking her urine as inconsistent with testosterone doping.<sup>254</sup> This low metabolite concentration coupled to the purported mishandling and resultant bacterial contamination allowed Beckett and Cowan to displace the testosterone production from Modahl’s body to a bacterial process outside of her body. The expert panel did not make a “natural” or authentic state of high testosterone excretion available to Modahl as they may have for many male high testosterone excreters. In this sense, she was not granted a testosterone-charged hormonal masculinity.

This displacement had the effect of maintaining Modahl’s hormonal femininity. She was not excreting too much testosterone; it was a post-excretion bacterial production of testosterone that gave the appearance of a hormonal gender transgression. Also, by displacing the elevated testosterone production to a bacterial process Modahl’s high T/E ratio was not an elevated T/E that might result in performance enhancement. In other words, Modahl’s purported hormonal masculinity and the inherent performance gain that comes with it were simultaneously renounced with the displacement of testosterone production to bacterial activity in “mishandled” urine samples.

The Modahl case challenged the limits of detection for female athletes. Like challenges to detection presented by male athletes, anti-doping researchers met this challenge with the suggestion and implementation of additional testing metrics to qualify would-be hormonal transgressions for these athletes. Post Modahl and similar cases, it was recommended that athletes’ urine undergo testing for the presence of bacteria by determining the urine’s acidity if it transgressed the T/E cutoff value.

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<sup>253</sup>S. Ramsey, "Appeal by Athlete's Testosterone Test Upheld.," *Lancet* 346, no. 8971 (1995), 370.

<sup>254</sup> *Ibid.*, 370.



**Figure 3.** Diane Modahl and Raija-Anneli Koskinen, a Finnish powerlifter during the 1990s in the 44 kg weight category.

*Female Athletes and Alcohol Induced Hypermasculinity?*

Similar to Modahl, an unnamed Finnish female powerlifter also challenged the limits of the T/E detection process.<sup>255</sup> This Finnish athlete claimed she went on a bit of a bender the night before she “gave a positive doping test with the T/E ratio 8.6.”<sup>256</sup> Her claim coupled to the “out-of-competition” nature of her test lent to her personal veracity. The Finnish anti-doping authorities then began a round of confirmation testing on her urine. This round of testing indicated her positive result was likely the result of heavy drinking not testosterone administration, also lending to her personal veracity. Hence, the Finnish anti-doping authorities decided to conduct a study on the effect of ethanol consumption on the T/E ratio with particular attention to females. This unnamed athlete prompted a study of norms pertaining

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<sup>255</sup> The female powerlifter in Leinonen’s study was not the pictured Raija-Anneli Koskinen. She was an unnamed 38 year old, 48 kg, powerlifter. Koskinen was competing at the time of the testing. Her image serves to remind the reader of one of the body types small powerlifters have. The juxtaposition of Koskinen and Modahl presents a powerful visual display of the range of body types and gender enactments female athletes possess.

<sup>256</sup> A. Leinonen, T. Karila, and T. Seppala, "An Increased Testosterone to Epitestosterone Ratio Due to High Doses of Ethanol---a Case Report on a Female Powerlifter" (paper presented at the Recent Advances in Doping Analysis, Cologne, Germany, 1996)., 167.

to ethanol consumption in males and females. They found females to be non-normal or to deviate from the more normal males in their metabolism of ethanol and its subsequent effect on the T/E ratio.

Using four male and four female volunteers, the Finnish researchers found that high amounts of alcohol consumption had increasing effects in female urinary T/E ratios.<sup>257</sup> These Finnish researchers found an average increase of 392% for the females they tested.<sup>258</sup> The Finnish researchers explained that the stronger effect in women derives from the fact that “large amounts of testosterone are formed via peripheral conversion from androgen precursors.”<sup>259</sup> In other words, these women only possess more testosterone when drunk and their alcohol converts their androgen precursors to testosterone.

By locating this testosterone production as a result of alcohol consumption, the Finnish researchers maintained both the veracity and femininity for their powerlifter as well as introduced a form of authentic alcohol related testosterone induced masculinity for these female athletes. Ironically, this acceptable alcohol induced testosterone enriched female masculinity emerged on the bodies of four non-athlete females. Importantly, these researchers concluded this was not a performance enhancing form of female hormonal masculinity due to the amount of alcohol consumed.

Testosterone detection studies like the Finnish one above and others that followed mark female athletes in relation to “normal” females. They bound female athletes to “normal” femininity while distinguishing their form of hormonal femininity from this norm. From these studies female athletes became a non-normal female type that can be made sense of through the “normal” type. As an inherent non-normal type within testosterone detection these female athletes were granted some forms of authentic

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<sup>257</sup> Ibid., 169. From the four “healthy females” the researchers demonstrated that “a dose of 2g of ethanol per kg of body weight caused an increase of the T/E ratio in the samples collected [the] day after ethanol consumption especially in females. The Finnish researcher also analyzed serum testosterone, urinary testosterone, epitestosterone, androsterone, creatinine, etiocholanolone, 11 $\beta$ -hydroxyandrosterone and 11 $\beta$ -hydroxyeticholanolone. The Finnish researchers found increases in the T/E ratio as well as the T:creatinine ratio. The epitestosterone: creatinine ratio appeared unaffected while the androsterone:creatinine and eticholanolone:creatinine ratios decreased all building towards a steroid profile understanding of alcohol induced hormonal changes.

<sup>258</sup> Ibid., 171.

<sup>259</sup> Ibid., 171.

hormonal masculinity, like their male counterparts, as in the case of ethanol consumption and their forms of authentic hormonal masculinity often excluded the possibility of performance enhancement.

Alcohol studies, like the Finnish case, presented challenges to the T/E cutoff as a means of evaluating female athletes' testosterone levels if alcohol is not accounted for first. They worked to ensure that alcohol related elevated testosterone levels did not count as true transgressions for female and male athletes. They maintained femininity for individual athletes, like the Finnish powerlifter, through a combination of their personal veracity and the technomedical study of ethanol's effects on male and female bodies. These types of studies also authenticated a temporary form of alcohol related hormonal hypermasculinity for female athletes.

*Female Hormones: Menstruation and Oral Contraception Studies.*

Ute Mareck-Engelke and her colleagues in Cologne continued to bring female bodies into the fold of anti-testosterone detection throughout the mid-1990s. They investigated the relationships between testosterone detection and excretion, menstruation, and the administration of oral contraceptives. Their menstruation and oral contraceptive studies marked two more ways females and female athletes pushed the limits of the T/E detection method and served to reinforce distinctions between male and female athletes. However, Mareck-Engelke's research also created new authentic ways for female athletes to display hormonal masculinity as correlated with testosterone while they instantiated female norms for the T/E ratio related to menstruation and oral contraceptive use.

In 1996, Mareck-Engelke and her colleagues began researching the effect of women's menstrual cycle on their steroid excretion profile. Working with five female subjects (aged:  $30 \pm 5.5$  years), they collected bimonthly urine samples for a year and measured these samples for ten different steroid glucuronides---building an annual "steroid profile."<sup>260</sup> Steroid glucuronides are steroids that one's body has glucuronidated, attached a glucuronic acid to, which increases the hormone's water solubility. This

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<sup>260</sup>U. Mareck-Engelke, U. Flenker, and M. Donike, "Stability of Steroid Profiles (5): The Annual Rhythm of Urinary Ratios and Excretion Rates of Endogenous Steroids in Female and Its Menstrual Dependency" (ibid.), 177

allows hormones to move around one's body and be excreted from one's body. In theory tracing steroid glucuronides over the course of a year would allow researchers to trace what steroids that individual produced and excreted. They found "there is no dependency between excretion of the investigated endogenous steroids and the day of the female menstrual cycle."<sup>261</sup> Mareck-Engelke's lack of dependency likened the female body to the male body by minimizing the role of menstrual hormonal flux in the measurement of the T/E ratio. Although it would be an over exaggeration to claim this as a form of masculinity, the study does break with the tradition of feminizing the body through hormonal instability and instead they created a consistent hormonal excretion norm for females.

In the following year Mareck-Engelke and her colleagues sought to determine the relationship between oral contraception use and the steroid profile for four healthy women subjects. They compared these women's results to those of: the daily urine samples from men over 30 days, urine samples taken from a group of women every 2 hours for 24 hours, and the aforementioned yearlong menstrual study subjects' results. Through these comparisons Mareck-Engelke and her colleagues determined oral contraceptives increased the T/E ratio by suppressing epitestosterone production in women.<sup>262</sup> This effect produced a sort of authentic hormonal masculinity for female athletes by allowing their T/E to be increased via the decreased epitestosterone production associated with oral contraception. Mareck-Engelke cautioned when judging female steroid profiles, especially those based on T/E, one must be mindful of the possibility of oral contraceptive use.<sup>263</sup> With this Mareck-Engelke simultaneously created a female norm---females taking oral contraceptives should be expected to have higher T/E ratios---and a form of authentic hormonal masculinity for these females based on their lower epitestosterone excretion.

Through her experiments Mareck-Engelke found that the androsterone:etiocholanolone ratio acted as a more stable detection ratio in women. Men and women excrete these steroids in in relatively

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<sup>261</sup> Ibid., 178

<sup>262</sup> U. Mareck-Engelke, U. Flenker, and W. Schanzer, "Stability of Steroid Profiles (6): The Influence of Oral Contraceptives on Steroid Profiles" (ibid.1997)., 140.

<sup>263</sup> Ibid., 143.



large amounts making it one of “the most stable parameter[s] in the steroid profile.”<sup>264</sup> Specifically, women excrete androsterone and etiocholanolone in quantities around 100 times greater than they excrete testosterone. However, the androsterone to etiocholanolone ratio presents a different set of challenges for anti-doping researchers. Both androsterone and etiocholanolone excretion rates increase after testosterone is administered and they are affected by external conditions like stress. Regardless, Mareck-Engelke produced females’ hormonal transgressions as alternatively accessible through this ratio. However, for other anti-doping researchers and regulators the inherent instabilities complicated androsterone and etiocholanolone as detection markers. Hence, Mareck-Engelke worked to develop norms for the ratio in women.

In Mareck-Engelke and her colleagues’ menstrual effects study, they developed borderline definitions for subject-based reference ranges of this ratio and the ratio of Adiol to Bdiol.<sup>265</sup> She and her colleagues calculated their subjects minimum, maximum, mean and coefficient of variation for these two ratios to demonstrate their relative stability and define the subject-based borderlines, see **Table 4** below.<sup>266</sup> Mareck-Engelke used these borderlines to describe the per subject range of these ratios for non-doped females, and with this description she enacted an individualization of endogenous steroid detection norms. She and her colleagues began defining subject-based detection norms and moving away from the population-based norms. This push towards subject-based detection for endogenous steroids continues today. Mareck-Engelke and her colleagues were among the first to realize that this subject-based method held more relevance for female athletes who seldom excreted testosterone in large quantities even when taking performance enhancing androgenic endogenous steroids. The subject-based ranges were more sensitive to the resultant changes in post-steroid administration steroid profiles through measurements like the A:E ratio and Adiol:Bdiol ratio. These researchers established this increased sensitivity by

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<sup>264</sup> Ibid., 143.

<sup>265</sup> U. Mareck-Engelke, U. Flenker, and M. Donike, "Stability of Steroid Profiles (5): The Annual Rhythm of Urinary Ratios and Excretion Rates of Endogenous Steroids in Female and Its Menstrual Dependency" (paper presented at the Recent Advances in Doping Analysis, Cologne, Germany, 1996)., 180. Adiol is 5 $\alpha$ -androstan-3 $\alpha$ -17 $\beta$ -diol and Bdiol is 5 $\beta$ -androstan-3 $\alpha$ -17 $\beta$ -diol.

<sup>266</sup> Ibid., 180.

showing the lower intra- and inter-individual coefficients of variation for these ratios along with the higher excretion rates for these hormones.

Mareck-Engelke and her colleagues continued to push the limits of testosterone detection through their research. They demonstrated alternative testing metrics for female athletes and presented female athletes as hormonally stable by finding that there “is no annual rhythm recognized for excretion rates” pertaining to the menstrual cycle. This finding lent these athletes a stable hormonal form often only granted to male athletes---endogenous *androgenic* hormonal stability throughout one’s menstrual cycle.

While facing the challenges presented by female athletes and their hormones for anti-doping detection, Mareck-Engelke and her colleagues studied the effects of oral contraceptives on their T/E ratios.<sup>267</sup> They demonstrated that oral contraceptive use could effect female athletes’ T/E ratios in a way consistent with testosterone use and this seemingly granted female athletes another form of authentic hormonal masculinity. Although, in this case, these athletes were granted this form precisely because the T/E ratio was increased due to a decrease in epitestosterone not an increase in testosterone. In other words, by showing that a decrease in epitestosterone production caused this increase Mareck-Engelke and her colleagues effectively maintained the femininity of these 4 females taking oral contraceptives while granting them an authentic hormonal masculinity gained through a non-androgenic steroid.

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<sup>267</sup> U. Mareck-Engelke, U. Flenker, and W. Schanzer, "Stability of Steroid Profiles (6): The Influence of Oral Contraceptives on Steroid Profiles" (ibid.1997).

**Table 4.** Replication of “Table 2. Stability of Steroid Profiles (female urine).”

Urine collected at the beginning and in the middle of the female menstrual cycle.

Total collection time: 1 year

Statistics of some selected steroid concentration ratios

min= minimum value, max= maximum value, st. de.= standard deviation,

and, c.v.= coefficient of variation.

	Volunteer 1	Volunteer 2	Volunteer 3	Volunteer 4	Volunteer 5
A/E min	0.76	0.71	0.48	0.52	0.46
A/E max	1.27	0.94	0.69	1.39	0.85
A/E mean	1.05	0.83	0.59	0.84	0.61
A/E st. de.	0.12	0.07	0.05	0.22	0.11
A/E c.v. (%)	12	9	9	26	18
T/E min	1.53	0.06	0.49	1.09	0.80
T/E max	3.45	0.35	1.34	5.11	2.19
T/E mean	2.32	0.17	0.96	2.94	1.23
T/E st. de.	0.35	0.09	0.24	0.90	0.37
T/E c.v. (%)	15	51	25	31	30
Adiol/Bdiol min	1.55	1.06	2.22	1.50	3.55
Adiol/Bdiol max	3.25	1.59	4.53	3.00	8.09
Adiol/Bdiol mean	2.37	1.27	3.02	2.23	5.63
Adiol/Bdiol st. de.	0.41	0.14	0.59	0.36	1.23
Adiol/Bdiol c.v. (%)	17	11	19	16	22

***Conclusion: Authenticating Hormonal Masculinity and Maintaining Femininity.***

From the 1980s to the mid-1990s, Western anti-doping researchers worked to multiply the available forms of authentic hormonal masculinity for male and female athletes. They often co-produced these new authentic forms of masculinity with challenges to existing detection techniques. Increasingly,

anti-doping researchers challenged the testosterone: epitestosterone (T/E) ratio method of regulating authentic hormonal hypermasculinity. Yet, the IOC retained the T/E cutoff value as the primary indication of testosterone use and this maintained male white Western hormonal masculinity as the dominant masculinity. This also allowed “non-dominant” masculinities to administer testosterone without being detected---again, upholding white Western male masculinity as the dominant form of masculinity to be attained, mimicked and heightened by *all* male athletes and aligning with their hypermasculine model of athletics.

Female athletes presented a new set of challenges for anti-doping researchers when authenticating hormonal masculinity. The hypermasculine model of athletics dictated that room must be spared for “naturally” testosterone rich female athletes as well as male athletes. Yet, those who administered testosterone had to be regulated and punished. Women and female athletes pushed the detection limits based on the T/E ratio, thereby challenging white Western masculinity, while Western anti-doping researchers worked to maintain their femininity.

In practice, female athletes were believed to excrete so little testosterone that it should be barely detectable by gas chromatography-mass spectroscopy. When individual female athletes did excrete more than the T/E cutoff value, it was often their personal veracity that they drew upon to maintain their moral innocence. They did this rather than drawing upon the hypermasculine model of athletics from which we might expect some female athletes to “naturally” have elevated T/E values. Female athletes maintained their hormonal femininity when charged with moral transgression and anti-doping researchers supported this approach.

Researchers sought to distinguish between testosterone “dopers” and athletes with “naturally” high testosterone levels to make sports more fair for all athletes. However, their research defined authentic ways of being male and female athletes that made participation in sport tenuous for some female athletes or cast them as gender transgressive – never fully freed from the suspicion of having an unfair and unnatural advantage over their “real” female counterparts. Particularly, intersexed athletes and naturally high female T/E excreters stand a real risk of being labeled transgressive. Throughout the 1980s

and 1990s anti-doping researchers continued to produced female athletes as low testosterone excreters. When these athletes were granted authentic forms of hormonal masculinity the performance enhancing aspect was truncated such that these women could experience heightened testosterone levels or seemingly heightened levels but only under circumstances where their athletic performance would not be altered.

## **Chapter 5. Detecting Authentic Hormonal Gender: the T/E Ratio as Screening Criteria.**

During the 1990s, testosterone detection increased in complexity as anti-doping researchers sought to minimize the number of false negatives and false positives produced by the T/E ratio. The T/E ratio threshold shifted from being evidence of doping to being a criterion for further testing. Carbon isotope testing through gas chromatography-combustion-isotope ratio mass spectrometry (GC-C-IRMS) and individualized hormonal profiling became the means of confirming testosterone doping. Anti-doping researchers also defined new “universal” and “natural” parameters for morally judging athletes through their use of GC-C-IRMS as a testosterone and endogenous steroid detection technique. This technique enabled anti-doping researchers to distinguish between who had and had not used endogenous performance enhancing steroids by measuring endogenous androgenic hormones, hormone metabolites and precursors in athlete’s urine samples; whereas, individualized testing through longitudinal time-period studies allowed for more variance between people while requiring a minimal intra-subject variance. These two techniques were co-produced with a different gender order than the one instantiated in the T/E ratio. Now, these techniques authenticated multiple hormonal gender states rather than authenticating just hormonal masculinity, as discussed in the previous chapter.

GC-C-IRMS and individualized testing continued to make sense of testosterone levels through the naturalized biological sex/gender categories; male and female continued to be the meaningful categories for judging the testosterone levels of athletes and their authentic hormonal gender. Increasingly, confirming an athlete’s authentic hormonal gender entailed detecting the use of pharmaceutically produced non-testosterone endogenous steroids and “prohormones.” The IOC and later WADA banned these “endogenous” substances for their “androgenic” and “anabolic” effects, many of which derived from the ability of the user to produce more testosterone while taking them. This increased testosterone production often evaded the T/E ratio threshold detection technique, thus further enticing anti-doping researchers to seek new methods of detection that refined and extended the bounds of

authentic hormonal gender states. These researchers simultaneously produced, ab-normalized and enacted new means of policing (authenticating) the bounds of hormonal gender states.

These technical means of policing hormonal gender states signaled a sense of “fairness” through procedural equity for athletes. Anti-doping researchers co-produced this procedural equity with the “inherent” physical differences between men and women. Both the procedural equity and these differences between men and women signal beliefs about the roles of the respective sexes in athletics. Again, premised on the hypermasculine model of athletics these western researchers sought to preserve spaces for “fair” competition for each of the sexes/genders and ensure there was no competition between the sexes/genders. The later assurance also meant ensuring women were not hormonally transgressing this boundary. Researchers created this assurance through the new detection methods. As discussed in the previous chapter, preserving this space for “fair” competition for each sex/gender had different forms. For male athletes, this was largely achieved by policing the boundaries of hormonal hypermasculinity; while for female athletes the boundaries of hormonal hypermasculinity, hormonal masculinity, maleness, and femaleness were policed through testing.

Technomedically creating equity amongst competitors with these hormone detection techniques required separation between the biological sex categories while this separation also reproduced inequities between these categories. Much like Title IX within the US,<sup>268</sup> these anti-doping researchers implicitly took the stance of creating equity while maintaining sex separation. These researchers again implicitly defined the “natural” male athletic advantage as a hormonal advantage garnered through endogenous steroids. Yet, their new detection techniques also shifted the hormonal hypermasculinity model of athletics from an expectation for all athletes (as discussed in the previous chapter) to a less permissible form of hormonal gender that could be better monitored. That is these researchers shifted many forms of

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<sup>268</sup> Iram Valentin, "Title IX: A Brief History," in *25 Years of Title IX Digest* (Newton, MA: Women's Educational Equity Act Resource Center, 1997).  
Birch Bayh and Patsy Mink, "20: Title IX of the Education Amendments of 1972," ed. 92nd United States Congress (Washington, D.C. 1972).

hormonal hypermasculinity from a non-normal attribute to an ab-normal, transgressive and illegitimate, attribute and in doing so shifted the forms of legitimate hormonal hypermasculinity available to athletes.

The equity enacted through the sex separate detection techniques also required quantification of the boundaries of hormonal gender states. For both longitudinal studies and GC-C-IRMS certain “ $\pm 3$  standard deviation” values came to define the norms, i.e. the acceptable limits, of hormonal gender. Within statistics  $\pm 3$  standard deviations to the mean is generally understood to include most values for a measured parameter with a normal distribution.<sup>269</sup> Within anti-doping circles this statistical rule takes on new significance as values that fall outside of this rule are viewed as doping positives or possible doping positives, marking ab-normal and potentially transgressive hormonal levels. Initially, anti-doping researchers applied the  $\pm 3$  standard deviation rule to population-based data and, hence, constituted population-based norms. Over time they increasingly applied this rule to individual-based data within endogenous steroid use cases, casting each individual athlete as a population subset that produced its own norms. The World Anti-Doping Agency (WADA)’s technical documents and guidelines enacted a set of norms related to this rule when they implemented the new GC-C-IRMS and longitudinal studies of subject steroid profiles to mark the bounds of the authentic hormonal gender states. Akin to the larger overall shift in this area of doping detection from population-based reference ranges to subject-based reference ranges, these implementations signal new formations of “fairness” and new formations of gender while maintaining the separation of biological sex categories to ensure sex-based equity within sports.

The following narrative traces how these researchers created the legitimate and illegitimate states for authentic hormonal gender through various endogenous steroid detection alternatives. These alternative detection practices aggregate in three WADA documents that both constrain and open possibilities for authentic hormonal gender(s). Where the previous chapter dealt with the authentication of masculinity and the maintenance of femininity, this chapter deals with the multiplication of available

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<sup>269</sup> SUNY Oswego, "The 68-95-99.7 Rule for Normal Distributions," <http://www.oswego.edu/~srp/stats/6895997.htm>. Anti-doping researchers assume this rule to hold true for their populations; they do not explicitly test the validity of this rule in cases where it is applied.



authentic gender states enacted through these detection practices. This multiplication exists in tension with the use of deeply dichotomized sex structuring by anti-doping researchers and sports governing authorities and the increasingly individualized forms of authentic hormonal gender. Together these anti-doping researchers and regulators redefine normal, non-normal, and abnormal hormonal genders through the binary sex system and their multiplication of hormonal genders. The following table summarizes the alternative detection practices discussed in this chapter and their relevance to authenticating hormonal gender and ab-normalization. The WADA technical document on the detection of endogenous androgenic anabolic steroids and its relevance to authentic hormonal gender also shape the chapter.

**Table 5.** Alternative Detection Practices & Their Production of Authentic Hormonal Gender.

Alternative Detection Practices	Summary of Methods & Measurements	Relation to Hormonal Gender	Ab-normalization Implications for Athletes
<b>GC-C-IRMS</b>	<ul style="list-style-type: none"> <li>measures <math>\delta^{13}\text{C}</math> values in isolated chemical compounds</li> </ul>	<ul style="list-style-type: none"> <li>shifts the measure of authentic hormonal gender to a measure of <math>\delta^{13}\text{C}</math> values in hormones</li> <li>allows for “natural” high T/E individuals</li> <li>largely defined with male urinalyses</li> </ul>	<ul style="list-style-type: none"> <li>natural “high” excreters remain non-normal</li> <li>“healthy” males constitute the normal/non-deviant</li> </ul>
Rapid Screen	<ul style="list-style-type: none"> <li>measures indirect <math>\delta^{13}\text{C}</math> values in 2 testosterone metabolites</li> <li>detect use of T in individuals with T/E values below 6 (and 4)</li> </ul>	<ul style="list-style-type: none"> <li>tightens the bounds of hormonal hypermasculinity such that now being below threshold is not always enough</li> </ul>	<ul style="list-style-type: none"> <li>an excess of carbon isotopes renders athletes ab-normal/transgressive</li> </ul>
Urinary Diol Screen	<ul style="list-style-type: none"> <li>measures <math>\delta^{13}\text{C}</math> values in testosterone metabolites and an Endogenous Reference Compound (ERC)</li> <li>compares these measurements to a control group of “healthy” men and compares individual’s testosterone metabolite values to ERC values</li> </ul>	<ul style="list-style-type: none"> <li>in theory authentic hormonal gender can be established on an individual basis.</li> <li>in practice, population based values still play a role.</li> </ul>	<ul style="list-style-type: none"> <li>“healthy” males- non-deviant, normals</li> <li>male athletes can be compared to this group</li> <li>male athletes- non-normals</li> </ul>

Alternative Detection Practices	Summary of Methods & Measurements	Relation to Hormonal Gender	Ab-normalization Implications for Athletes
Epitestosterone Screen	<ul style="list-style-type: none"> <li>measure the concentration and <math>\delta^{13}C</math> value of epitestosterone in “healthy” male control subjects and athletes</li> <li>established control group mean values for these</li> <li>athlete values outside of the 3SD range for <math>\delta^{13}C</math> values indicate epitestosterone use</li> </ul>	<ul style="list-style-type: none"> <li>authentic hormonal gender encompasses multiple hormones even those that do not enhance performance and their <math>\delta^{13}C</math> values</li> <li>previous “ethnic” distinctions give way to minimized distinctions across racialized “ethnic” categories</li> </ul>	<ul style="list-style-type: none"> <li>racialized “ethnic” categories minimize ethnic distinctions</li> <li>many racialized “ethnic” groups rendered non-normal</li> </ul>
Androstenedione Screen in Women	<ul style="list-style-type: none"> <li>combined GC-MS &amp; GC-C-IRMS to determine if androstenedione metabolites were present and derive <math>\delta^{13}C</math> values for androsterone and etiocholanolone.</li> </ul>	<ul style="list-style-type: none"> <li>defined authentic hormonal gender for women as not having androstenedione OH metabolites present and having <math>\delta^{13}C</math> values within 3 SD of mean of the women not receiving androstenedione.</li> </ul>	<ul style="list-style-type: none"> <li>females rendered a non-normal category relative the more normal male category</li> </ul>
<i>Population-based steroid profiles and threshold values</i>	<ul style="list-style-type: none"> <li>GC-MS or HPLC-MS to determine concentration values of excreted hormones.</li> <li>(mean) hormone excretion values as determined within a defined population.</li> </ul>	<ul style="list-style-type: none"> <li>populations are always split into men and women---dichotomous gender/sex structures these profiles and the authentic forms of gender they produce</li> </ul>	<ul style="list-style-type: none"> <li>produce male norms and female non-normal norms</li> </ul>
<b>Longitudinal Studies</b>			
Subject-based steroid profiles	<ul style="list-style-type: none"> <li>GC-MS or HPLC-MS to determine concentration values of excreted hormones</li> </ul>	<ul style="list-style-type: none"> <li>seem to multiply authentic gender infinitely while they do open gender they are premised on the dichotomous sex/gender structure.</li> </ul>	<ul style="list-style-type: none"> <li>male and female categories exist in opposition (normal:non-normal)</li> <li>spectrum of genders for each.</li> </ul>

Alternative Detection Practices	Summary of Methods & Measurements	Relation to Hormonal Gender	Ab-normalization Implications for Athletes
Cologne Protocol's Endocrinological Study	<ul style="list-style-type: none"> <li>• GC-MS or HPLC-MS to determine concentration values of excreted hormones.</li> <li>• combines using population-based limits and longitudinal studies of individual steroid profiles</li> </ul>	<ul style="list-style-type: none"> <li>• authenticating hormonal gender is based on 3 SD from the subject reference ranges obtained through a longitudinal study.</li> <li>• authentic hormonal gender multiplies but population-based thresholds continue to be screening criteria.</li> </ul>	<ul style="list-style-type: none"> <li>• see above</li> </ul>
Bayesian Model-Predictive Profiles	<ul style="list-style-type: none"> <li>• GC-MS or HPLC-MS to determine concentration values of excreted hormones</li> <li>• building the Bayesian model based on sex, age, genetic type and other relevant variables to determine testosterone and/or endogenous steroid use</li> </ul>	<ul style="list-style-type: none"> <li>• authentic hormonal gender is confirmed by mathematical models which now record and account for biological sex, age and genetic differences.</li> <li>• "norms" established per individual overtime</li> </ul>	<ul style="list-style-type: none"> <li>• each individual athlete becomes normal, non-normal, and potentially ab-normal.</li> </ul>

These alternative testing methods offer differing forms of authentic hormonal gender based on what Trevor Pinch calls changing the similarity and difference judgements of the athletes being tested.<sup>270</sup> Likewise, anti-doping researchers render the social and political negotiations of the tests and their subsequent policy outcomes invisible through their work. These negotiations produce forms of procedural equity and "fairness" replete with social and political relationships by producing the relevant categories for judging authentic hormonal gender state and endogenous steroid use. These anti-doping researchers act as technomoral regulators by producing the terms for judging authentic hormonal gender.

This technomorality is steeped in cultural assumptions about gender and biological sex, but makes room for their cultural reinterpretation, as suggested by my concept of authentic hormonal gender; the technomedical production and legitimation of hormonal gender states for athletes. Authentic hormonal

<sup>270</sup> Trevor Pinch, "Testing- One, Two, Three...Testing!: Toward a Sociology of Testing," *Science, Technology & Human Values* 18, no. 1 (1993)., 32.

gender exists within sports structures that maintain the separation of binary biological sex categories, but also allows athletes to exhibit a range of hormonal gender states within the binary sex categories. Gender authentication names a process of ab-normalization for the hormonal gender states it produces, rendering them policeable. The concept of authentic hormonal gender makes the tensions between the multiplicity of available forms of valid (non-cheating) hormonal gender and this sex segregated system more visible. Once these tensions become visible, we can assess the various forms of “fairness” enacted by these methods.

***WADA Technical Document EAAS2004: Creating a Universal “Fairness.”***

“The results will be reported as consistent with the administration of a steroid when the  $^{13}\text{C}/^{12}\text{C}$  value measured for the metabolite(s) differs significantly i.e. by 3  $\delta$  units or more from that of the urinary reference steroid chosen.”<sup>271</sup>

In 2004, the WADA issued a technical document for reporting and evaluating “testosterone, epitestosterone, T/E Ratio and other endogenous steroids.” These guidelines recommended the use of GC-C-IRMS testing and longitudinal individual athlete profiling to confirm doping positives where the T/E ratio exceeded 4.<sup>272</sup> Further, if an athlete’s concentration of testosterone or epitestosterone exceeded 200 ng/mL, their concentration of androsterone or etiocholanolone exceeded 10,000 ng/mL, or their concentration of DHEA exceeded 100 ng/mL then a GC-C-IRMS study should be conducted.<sup>273</sup> These parameters set the initial bounds of legitimate and illegitimate forms of hormonal gender. If this study proved inconclusive then the athlete should undergo a longitudinal evaluation of their urinary metabolites. As such the T/E ratio no longer served as evidence of doping but instead shifted to a screening criterion

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<sup>271</sup> World Anti-Doping Agency Laboratory Committee, "Reporting and Evaluation Guidance for Testosterone, Epitestosterone, T/E Ratio and Other Endogenous Steroids.," in *WADA Technical Document* (Lausanne 2004)., 3.

<sup>272</sup> Dick Pound, "Minutes of the WADA Foundation Boarding Meeting," in *World Anti-Doping Agency Minutes* (Montreal 2004). In 2005, the World Anti-Doping Agency lowered the T/E ratio from 6 to 4.

<sup>273</sup> Committee, "Reporting and Evaluation Guidance for Testosterone, Epitestosterone, T/E Ratio and Other Endogenous Steroids.," 2.

for further testing. Further, it was through longitudinal studies and GC-C-IRMS that researchers could distinguish between legitimate, “non-normal”, authentic hormonal genders and illegitimate, ab-normal, non-authentic ones.

“Endogenous” steroid use presented detection challenges similar to those of other “naturally” produced performance enhancers. Endogenous usually refers to substances found within and produced within the human body. However, in the case of “endogenous” steroids, anti-doping researchers extend the term to include pharmaceutically produced hormones, pro-hormones, and hormone stimulators that share the same chemical structure as those produced within and by the human body. Since these steroids naturally occur within human bodies, detection methods often rely on indirect markers, such as elevated hormone ratios, which are detected through urinary steroid profiling.

As is true for most rules and regulations, this WADA technical document regulating endogenous steroid use appeals to certain universalized notions of fairness: all athletes will be tested for testosterone, epitestosterone and other endogenous steroids; all athletes who have non-normal urinary steroid profiles will be further tested and this testing should be uniform at each laboratory. Within this uniform procedure, the WADA specifies that “there is significant variation between individuals.”<sup>274</sup> By appealing to a uniform testing procedure, these anti-doping regulators and scientists produced a sense of equity across diverse groups of athletes with a variety of hormone levels and steroid profiles. Through the WADA document this procedural equity required laboratories to account for known variations, such as those between Caucasians and Asians or those between men and women. However, the document did not specify how to account for these variations or what these variations entail. Hence, it left athletes with variations from the “norm” (the white/Caucasian male) in an ambiguous space for anti-endogenous steroid detection and the concomitant gender authentication it produced.

The document specified when to use GC-C-IRMS and with this specification the WADA set uniform conditions for all athletes. These conditions grew out of previous studies’ population-based

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<sup>274</sup> Ibid., 1-2.

reference ranges such as the Cologne Protocol that also helped set the terms of longitudinal subject-based studies.<sup>275</sup> When an athlete exceeded one of the conditions, stated above, then that individual athlete's variations from these population-based reference range norms came into play. That is, now, population-based reference ranges provided the conditions for further testing but did not provide the full basis for gender authentication or hormone level evaluation. For example, some athletes consistently excrete above the T/E ratio cutoff and these athletes could either obtain medical certification of this or undergo a longitudinal study. If their variation remains consistent across longitudinal studies then they are less likely to be deemed endogenous steroid users. Rather, this consistency marks a "natural" variation from the norm that may or may not confer athletic advantage, and, this "natural" variation is an authentic hormonal gender.

If their variation was inconsistent with their own longitudinal steroid profile then anti-doping researchers would deem these athletes as endogenous steroid users and subject them to doping penalties. Anti-doping researchers deemed these variations illegitimate hormonal gender states. Additionally, if the carbon isotope ratio of their testosterone, testosterone metabolites or other endogenous steroids differs "by 3  $\delta$  units or more from that of the urinary reference steroid(s) chosen"<sup>276</sup> from their own excretion then anti-doping researchers would deem them endogenous steroid users. In both cases, individual consistency served as the marker of "natural" hormone values, and, thereby authenticated hormonal gender.

With this technical document, WADA set bounds on "fair play" and "equity" in treatment for both sexes while simultaneously bounding the authentic genders as hormonal levels or carbon isotope

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<sup>275</sup> H. Geyer et al., "The Cologne Protocol to Follow up High Testosterone/Epitestosterone Ratios" (paper presented at the Recent Advances in Doping Analysis (4), Koln, 1997). In the Cologne Protocol, Geyer and his colleagues find that 97.5% of men have testosterone concentrations below 137.4 ng/mL while the same percentage of women have concentrations below 57.3 ng/mL. Likewise, epitestosterone concentrations of 97.5% of men and women were 112 ng/mL and 42.2 ng/mL respectively.

C. Ayotte, D. Goudreault, and A. Charlebois, "Testing for Natural and Synthetic Anabolic Agents in Human Urine," *Journal of Chromatography B* 687(1996). Ayotte and colleagues found that 99% of men had testosterone and epitestosterone concentrations below 225 ng/mL and 180 ng/mL respectively.

<sup>276</sup> Committee, "Reporting and Evaluation Guidance for Testosterone, Epitestosterone, T/E Ratio and Other Endogenous Steroids.", 3.

ratio values each sex was permitted to have. The “equity” created in this document grew out of studies of detection by GC-C-IRMS and studies of endogenous steroid administration. In striving to achieve “equity” these researchers produced policeable hormonal gender states through their technical authentication practices.

### ***Producing New Detection Methods for Endogenous Steroids.***

Rodrigo Aguilera pioneered the use of GC-C-IRMS to detect pharmaceutically synthesized endogenous steroid use by athletes. Aguilera currently serves as the head of the Portuguese WADA accredited National anti-doping laboratory. Previously, he worked at the IOC and later the WADA accredited anti-doping laboratory in Los Angeles (LA). While in LA, Aguilera GC-C-IRMS tested athletes at the Atlanta and Salt Lake Olympic Games as well as the 2007 Pan-Am Games. During the early 2000s Aguilera and his colleagues undertook three particular GC-C-IRMS studies using male subjects that informed the 2004 WADA technical document on reporting and evaluating testosterone and other endogenous steroids.<sup>277</sup> These studies defined authentic hormonal gender, for male athletes, as measured by carbon isotope ratio values and helped redefine endogenous steroid dopers (unauthentic hormonal genders) to include those using epitestosterone as well as those who exceeded concentration cutoffs for testosterone, epitestosterone, androsterone, and/or etiocholanolone. They also produced several male “norms” for these new authentic hormonal gender states. Through this production of norms Aguilera and his colleagues participated in the ab-normalization of authentic hormonal gender states.

To do this, Aguilera and his colleagues quantified testosterone metabolites, urine diols, and urinary epitestosterone to validate measurements of the difference in the amount of “heavy carbon,”  $\delta^{13}\text{C}$ , in testosterone and epitestosterone. These measurements hinged upon the known differences between the “natural” abundance of  $^{13}\text{C}$  and the abundance of  $^{12}\text{C}$  in pharmaceutically produced endogenous steroids. Testosterone produced within a human body comes from the food that person has eaten, such as corn-fed

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<sup>277</sup> Ibid., 5-11.

beef, while pharmaceutically synthesized testosterone comes from plants, often soy and yams, that contain different amounts of  $^{13}\text{C}$  than found in most diets.<sup>278</sup> That is pharmaceutically produced steroids contain less  $^{13}\text{C}$  than those produced “naturally” within the body. One method for determining this difference is to measure the carbon isotope values of the endogenous steroids in question, their precursors, and metabolites and compare them to the carbon isotope values of an unrelated, metabolically distinct, hormone in the same athlete.

This new isotopic model still allowed for “naturally” elevated T/E ratios, however, Aguilera and his colleagues shifted the grounds for judging them. Now, the “naturally” elevated T/E ratio was a potentially transgressive non-normal attribute of athletes. This “natural” elevated T/E ratio could potentially confer athletic advantage, yet, the abundance of carbon isotopes in these hormones did not serve as markers of a “natural” advantage of males in athletics. Rather, it served as a means of evaluating their moral and hormonal character.

*Shifting the Measure of Authentic Hormonal Gender.*

In his 2000 study, Aguilera and his colleagues “described and validated a gas chromatography/combustion/isotope ratio mass spectrometry method for measuring the  $\delta^{13}\text{C}$  values of the acetate derivatives of urinary etiocholanolone and androsterone,”<sup>279</sup> two major metabolites of testosterone. Aguilera and his colleagues developed this method by administering testosterone enanthate to one of two healthy male subjects. Subsequently, Aguilera quantified how much  $^{13}\text{C}$  was present in the etiocholanolone and androsterone of this subject. They found that before administration this subject had

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<sup>278</sup> Larry D. Bowers, "Testosterone Doping: Dealing with Genetic Differences in Metabolism and Excretion," *Journal of Clinical Endocrinology and Metabolism* 93, no. 7 (2008), 2470. Bowers also notes testosterone and other hormones can be synthesized using other plants, like orchids, with similar  $^{13}\text{C}$  values to most naturally produced testosterone.

<sup>279</sup> Rodrigo Aguilera, Thomas E. Chapman, and Don H. Catlin, "A Rapid Screening Assay for Measuring Urinary Androsterone and Etiocholanolone Delta13c (0/00) Values by Gas Chromatography/Combustion/Isotope Ratio Mass Spectrometry," *Rapid Communications in Mass Spectrometry* 14(2000), 2294.



baseline values around -25 ‰ and after administration these values decreased to around -31 ‰.<sup>280</sup>

“Two weeks after testosterone administration was discontinued, the  $\delta^{13}\text{C}$  values remained abnormally low while the urine testosterone/epitestosterone (T/E) ratio returned to less than 6.”<sup>281</sup> Hence, these abnormally low  $\delta^{13}\text{C}$  values provided a means of catching athletes using testosterone without breaching the T/E threshold.<sup>282</sup> Further, Aguilera and his colleagues proposed that this screen could be used in place of the T/E screen or when the T/E ratio resulted in values below 6 to detect testosterone users.<sup>283</sup>

With this Aguilera and his colleagues created new means of authenticating hormonal gender for male athletes. Implicitly, Aguilera and colleagues defined the “healthy” male subjects as the normal, non-deviant, category and as a proxy for male athletes in this study. These researchers ascertained how male athletes would respond to testosterone administration by administering testosterone to one of these normal subjects. Now, male athletes with abnormally low  $\delta^{13}\text{C}$  values were also transgressive, having an unauthentic hormonal gender, through this proxy. The “healthy” male values rendered such athletes transgressive regardless of their T/E ratio. Simultaneously, Aguilera and his colleagues tightened the bounds on hormonal hypermasculinity for it was no longer enough to remain below the T/E ratio which allowed many male athletes to experience hormonal hypermasculinity four-times the previous population-based value, 1:1.

#### *Comparing “Healthy Men” to Male Athletes to Catch Testosterone Cheats.*

Aguilera and his colleagues undertook a study to determine the  $\delta^{13}\text{C}$  values of testosterone. This study offered an alternative measure of authentic hormonal gender through a comparative detection method, rather than the rapid screening model previously discussed. To do this Aguilera and his colleagues measured the  $\delta^{13}\text{C}$  ranges and standard deviations of two testosterone metabolites and an

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<sup>280</sup> This method differed from the aforementioned method using internal standard hormones or endogenous reference compounds (ERC) as anti-doping researchers call them.

<sup>281</sup> *Ibid.*, 2294.

<sup>282</sup> *Ibid.*, 2299.

<sup>283</sup> *Ibid.*, 2299.

unrelated hormone.<sup>284</sup> From these measurements they established population-based  $\delta^{13}\text{C}$  ranges, the  $\delta^{13}\text{C}$  range for an “internal” standard, and  $\delta^{13}\text{C}$  parameters for a male athlete subpopulation. Hence, they solidified a type of non-normal, yet legitimate, authentic hormonal gender for male athletes.

These researchers cast “healthy” men as a non-deviant hormonal gender proxy for judging male athletes. This began when they selected a control group of “73 healthy males and 6 athletes”<sup>285</sup> to calculate the ranges of  $\delta^{13}\text{C}$  values. They collected 24 hour urine samples from the 73 UCLA medical students. Then Aguilera and his colleagues determined the  $\delta^{13}\text{C}$  values for three diols: 5 $\beta$ -androstane-3 $\alpha$ ,17 $\beta$ -diyl diacetate (5 $\beta$ A); 5 $\alpha$ -androstane-3 $\alpha$ ,17 $\beta$ -diyl diacetate (5 $\alpha$ A); 5 $\beta$ -pregnane-3 $\alpha$ , 17 $\beta$ -diyl diacetate (5 $\beta$ P). 5 $\beta$ A and 5 $\alpha$ A are testosterone metabolites; 5 $\beta$ P is not a testosterone metabolite. They determined that “[f]or the control group, the mean  $\delta^{13}\text{C}$  (SD) values were -25.69 0/00 ( $\pm$ 0.92 0/00), -26.35 0/00 ( $\pm$ 0.68 0/00) and -24.26 0/00 ( $\pm$ 0.70 0/00), for 5 $\beta$ A, 5 $\alpha$ A, and 5 $\beta$ P, respectively.”<sup>286</sup> Thus, Aguilera and his colleagues instantiated this control group as a reference group, or set of norms, that allowed for comparisons to suspected testosterone using male athletes.<sup>287</sup> Aguilera and his colleagues produced “healthy” male hormonal gender the non-deviant state to compare to the hormonal gender of male athletes.

However, one norm was not enough. Aguilera and his colleagues also determined the 5 $\beta$ P value as an internal hormone reference, i.e. endogenous reference compound, for carbon isotope ratios in each individual. They also created population-based norms for this compound from their control group; it was both an “internal” standard per individual and an “external” standard drawn from this group. Both norms worked to solidify the bounds of legitimate hormonal gender states for athletes. Those who exceeded the

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<sup>284</sup> Rodrigo Aguilera et al., "Performance Characteristics of a Carbon Isotope Ratio Method for Detecting Doping with Testosterone Based on Urine Diols: Controls and Athletes With Elevated Testosterone/Epitestosterone Ratios.," *Clinical Chemistry* 47, no. 2 (2001)., 292.

<sup>285</sup> Ibid., 292.

<sup>286</sup> Ibid., 292.

<sup>287</sup> This is quite interesting in light of blood doping researchers marking and drawing upon the distinctions between “normal men” and “male athletes,” these anti-doping researchers draw upon the similarities between these two categories to produce a detection method.

3 standard deviations from these norms were now understood to be endogenous steroid users, an illegitimate hormonal gender state.

Specifically, these researchers also created space for “naturally” high excreting male athletes to obtain an authentic hormonal gender state. That is they produced a new means of policing the non-normal high excreters when they characterized the above hormonal parameters for 6 male athletes with elevated T/E ratios above 6.<sup>288</sup> These athletes were not assumed to be testosterone users, rather, they represented possible users and “false positives,” i.e. naturally high T/E ratio male athletes. This sub-population of athletes served as detection validity subjects and the embodiment of the non-normal type to be policed but not necessarily deemed illegitimate. More succinctly, Aguilera and his colleagues reproduced “naturally” high excreting male athletes as a legitimate and authentic hormonal gender state through this sub-population of athletes.

Aguilera and his colleagues produced a detection technique capable of distinguishing between the two previously mentioned hormonal gender states, testosterone users and naturally high T/E male athletes, by determining the origin of the testosterone of each person tested. To do this the researchers compared  $\delta^{13}\text{C}$  values of their male athletes to those of their control group, normal men. This comparison rendered the hormonal hypermasculinity of these athletes policeable. Having established the mean, SDs,  $\pm 3$  SDs, and ranges of  $\delta^{13}\text{C}$  for the control group, the researchers assessed the origin of the elevated T/E ratios. Aguilera and his colleagues defined testosterone users, an illegitimate hormonal gender state, as having lower  $5\beta\text{A}$  and  $5\alpha\text{A}$   $\delta^{13}\text{C}$  values as well as large isotope differences between  $5\beta\text{A}$  or  $5\alpha\text{A}$  and  $5\beta\text{P}$ .<sup>289</sup> They simultaneously created non-normal high excreting athletes as a policeable hormonal gender state through these comparisons.

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<sup>288</sup> Ibid., 292.

<sup>289</sup> Ibid., 299. These definitions were based on the lower  $^{13}\text{C}$  content of pharmaceutically produced testosterone and its precursors producing lower  $^{13}\text{C}$  content within the metabolites of testosterone, like  $5\beta\text{A}$  and  $5\alpha\text{A}$ . Likewise, they expected to see changes in the ratios of  $5\beta\text{A}/5\beta\text{P}$  and  $5\alpha\text{A}/5\beta\text{P}$  ratios. Aguilera and his colleagues expected these ratio differences because  $5\beta\text{P}$  is not a metabolite of testosterone.

For Aguilera and his colleagues, “Athletes with naturally elevated urine T/E ratios would be expected to have persistently elevated T/E ratios, unremarkable urine testosterone concentrations, and values for 5 $\beta$ A and 5 $\alpha$ A that are within  $\pm 3SD$  of the mean of the control group.”<sup>290</sup> Hence, Aguilera and his colleagues co-produced both the hormonal gender states and a method for differentiating between them, thus, rendering “naturally” high T/E male athletes, a non-normal legitimate state, and those using testosterone, an illegitimate state. With this method, they maintained the availability of high T/E ratios for male athletes while they further limited previous forms of permissible hormonal hypermasculinity.

*An Epitestosterone Detection Method: Male Athletes and 3 SD from the Mean.*

In 2002, Aguilera and his colleagues devised a method for detecting epitestosterone using GC-C-IRMS. Epitestosterone, although not a performance enhancing substance, can mask testosterone use by lowering the T/E ratio. Hence, a “definitive method for detecting epitestosterone [was] needed.”<sup>291</sup> Aguilera and his colleagues used a new, larger, “control group” of healthy, non-athletes. They, then, assessed the epitestosterone  $\delta^{13}C$  values for the control group and synthetic epitestosterone. In the process, they minimized “ethnic” distinctions in  $\delta^{13}C$  values by using race and color categories in place of “ethnic” categories. They also accomplished this by creating quantified “norms” for each ethnicity that minimized these distinctions across the ethnicities. This further entrenched non-athlete “normal” males as a proxy for “male athletes” in terms of epitestosterone concentration and  $\delta^{13}C$  values of epitestosterone. They produced population-based standards for assessing epitestosterone use through this proxy group. Likewise, the measurement of the  $\delta^{13}C$  values for synthetic epitestosterone also aided in epitestosterone use assessment. Both produced authentic hormonal gender states in terms of epitestosterone  $\delta^{13}C$  values, also making it policeable.

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<sup>290</sup> Ibid., 299.

<sup>291</sup> Rodrigo Aguilera, Caroline Hatton, and Don Catlin, "Detection of Epitestosterone Doping by Isotope Ratio Mass Spectrometry," *ibid.* 48, no. 4 (2002), 629.

Aguilera and his colleagues used “456 male, first-year UCLA medical students between the ages of 20 and 38”<sup>292</sup> as their control group subjects. They, then, used GC-MS to quantify the epitestosterone concentration for each subject, divided these subjects into five “ethnicities” (see table below), and calculated the distribution of epitestosterone concentration per “ethnicity.”<sup>293</sup> Aguilera and his colleagues determined the geometric mean of the epitestosterone concentration for these subjects was 27.0  $\mu\text{g/L}$  which made the IOC cutoff, 200  $\mu\text{g/L}$ , 2.8 standard deviations away from this mean. Hence, they suggested that the IOC had appropriately set this cutoff value to detect most epitestosterone users or at least those who fell outside of the 3SD range. Aguilera and his colleagues redefined this as a “norm” for epitestosterone concentration. Implicitly, they defined those outside of this “norm” as having an illegitimate hormonal gender state. Along with this, they enacted these racialized “ethnic” categories as potential markers of difference among men when determining hormonal gender states despite not finding significant differences between these groups.

These researchers found similar distributions of epitestosterone concentrations per each “ethnicity,” as summarized in the replication of his “Table 1” below. This table also highlights their problematic use of the word “ethnicity.” Aguilera and his colleagues divided the student control group into five “ethnicities:” “Caucasian,” “Asian,” “Hispanic,” “Black,” and “Unidentified.” One of these, “Hispanic,” designates an actual ethnic group<sup>294</sup> while the others designate races, colors, or ambiguity. This problematic presentation of race and color as “ethnicity” works to diminish distinctions across ethnic groups. As racial and color category members these sub-populations have considerably less in common than members of an ethnic group might. Particularly, ethnic groups often share ancestry, geographical location, and cuisine; all of which would potentially affect the relative amounts of carbon isotopes in an individual. Racial and color groups do not necessarily share any of these things.

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<sup>292</sup> Rodrigo Aguilera, Caroline Hatton, and Don Catlin, "Detection of Epitestosterone Doping by Isotope Ratio Mass Spectrometry," *Clinical Chemistry* 48, no. 4 (2002)., 630.

<sup>293</sup> *Ibid.*, 631.

<sup>294</sup> Ethnic groups are social categories of people who self-identify as part of the group and often share a common ancestry, culture, and geographic location. While they may also share phenotypical traits, however, race and color are not markers of ethnic belonging.

**Table 6.** Replication of “Table 1. Distribution of Urinary Epitestosterone Concentration (microgram/L) by Ethnicity.\* (\*values in parentheses are in ng/mg creatinine).”

Percentile	All	Asian	Black	Caucasian	Hispanic	Unidentified (unknown +other)
10	11 (10)	11 (9)	8 (7)	11 (10)	13 (11)	9 (9)
25	17 (14)	16 (14)	17 (10)	17 (16)	18 (14)	17 (12)
50	29 (21)	27 (19)	25 (19)	29 (24)	29 (23)	26 (21)
75	45 (32)	41 (28)	52 (25)	45 (35)	47 (31)	43 (30)
90	68 (44)	61 (36)	77 (44)	65 (46)	69 (45)	68 (42)
Minimum	3 (3)	3 (4)	5 (5)	5 (5)	4 (3)	6 (6)
Maximum	162 (91)	116 (91)	108 (74)	126 (82)	162 (73)	152 (56)
<i>n</i>	456	99	34	166	88	69

Aguilera and his colleagues established the  $\delta^{13}\text{C}$  values of epitestosterone in both these “normal” males and synthetically produced epitestosterone. They selected 43 urine samples from the control group with epitestosterone concentrations above  $40 \mu\text{g/L}$  to establish their reference values. These men had a mean  $\delta^{13}\text{C}$  value of  $-23.8 \text{ ‰}$  (SD,  $0.93 \text{ ‰}$ ).<sup>295</sup> With this established these researchers quantified the  $\delta^{13}\text{C}$  values of four synthetic epitestosterones and determined that the synthetic epitestosterone had significantly different  $\delta^{13}\text{C}$  values from their control group; the mean value of the synthetic epitestosterone was  $-30.3 \text{ ‰}$ . This was well outside of the 3SD range. Thus, Aguilera and his colleagues found that an individual taking synthetic epitestosterone should also have significantly different  $\delta^{13}\text{C}$  values from the control group. Now, Aguilera and his colleagues required male athletes with an authentic hormonal gender to have  $\delta^{13}\text{C}$  values of epitestosterone greater than “ $-26.6 \text{ ‰}$  (control group mean -

<sup>295</sup> Ibid., 629.

3SD)<sup>296</sup> while those with values that significantly differed from the control group concentration values could also be possible users, i.e. athletes with an illegitimate hormonal gender state. These values established more “norms” for authenticating hormonal gender states.

Aguilera and his colleagues further demonstrated the efficacy of this method of policing hormonal gender by determining the  $\delta^{13}\text{C}$  values for 10 athletes with epitestosterone concentrations above  $180 \mu\text{g/L}$  ( $624 \text{ nmol/L}$ ).  $180 \mu\text{g/L}$  ( $624 \text{ nmol/L}$ ) was close to the IOC cutoff limit and suggested possible cases of undetected epitestosterone use. Hence, these male athletes represented possible athletes with illegitimate hormonal gender states. They found that “[n]ine of the 10 athletes’ urine samples ...had  $\delta^{13}\text{C}$  values within  $\pm 3\text{SD}$  of the control group. The  $\delta^{13}\text{C}$  value of epitestosterone in one sample was  $-32.6$  (z-score, 9.4) suggesting that epitestosterone was administered. In addition, the likelihood of simultaneous testosterone administration was supported by the low  $\delta^{13}\text{C}$  values for androsterone and etiocholanolone.”<sup>297</sup> Hence, Aguilera confirmed one case of epitestosterone use and cast doubt on eight of the nine remaining athletes by reporting their below mean  $\delta^{13}\text{C}$  values. With this Aguilera and his colleagues simultaneously demonstrated to anti-doping researchers that epitestosterone  $\delta^{13}\text{C}$  values could work to catch epitestosterone dopers and would be more useful if new limits were set as well.<sup>298</sup> This instantiated new terms for authentic hormonal gender states based on epitestosterone  $\delta^{13}\text{C}$  values. Again, a T/E ratio under threshold no longer amounted to an authentic hormonal gender state when such GC-C-IRMS methods were used.

Aguilera and his colleagues shifted the measure of authentic hormonal gender from the quantity of “male” hormones and their non-androgenic homologues to the carbon molecules that make up these

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<sup>296</sup> Ibid., 635.

<sup>297</sup> Ibid., 629.

<sup>298</sup> Pinch, "Testing- One, Two, Three...Testing!: Toward a Sociology of Testing." As Pinch points out researchers build tests with expectations in mind and testing technologies and technical methods are enmeshed in the social. My purpose here is to relay the means by which Aguilera convinced or attempted to convince his colleagues that his method was valid and useful. It is not to judge the truth of his claims or tests as the “real” and “true” answers to how well the method actually catches epitestosterone and testosterone using athletes cannot be determined especially by laboratory tests. Aguilera actually shows that neither method caught 8 of these athletes. Hence, he argues for lowering limits because he suspects these 8 have doped.

hormones. Hence, they give more weight to the carbon isotope ratio than the concentration and T/E ratio cutoffs set by the IOC. By shifting the methods of confirming hormonal gender, these researchers seem to displace “hormonal” gender by appealing to a seemingly gender neutral “natural truth”---the relative abundance of  $^{13}\text{C}$  in our (universal) world. Yet, this “natural” truth is remade on and through male bodies and it attempts to minimize cultural and “ethnic” distinctions. It is a thoroughly gendered and racialized “natural” truth.

Other researchers believed that cultural distinctions such as diet, geographic location, and “ethnic” origin influence the amount of relative abundance of carbon isotopes in our bodies. However, Aguilera and his colleagues minimized these distinctions by characterizing their control group as a singular mean value for detection criteria. Further, Aguilera and his colleagues seem to use the term, “ethnicity,” to denote phenotypical and racial differences across populations rather than cultural distinctions. By using this term instead of race for his racial categories the cultural distinctions that constitute ethnic distinctions seem less important or disappear altogether. The next section traces a study in which researchers administered endogenous steroids to build “better” detection methods for females.

*IRMS and Women: The First Western Women’s Administration Study.*

In 2002, Thomas Bassindale and his colleagues at King’s College London performed the first endogenous androgenic substance administration study on women in the West.<sup>299</sup> Unlike their GDR predecessors, they aimed to make sense of the effects of a small (single) dose of androstenedione in women and determine effective detection techniques regarding this substance in women.

Androstenedione, mentioned in the previous chapter, is largely sold as an over-the-counter “prohormone” nutritional supplement; it metabolizes into testosterone and, therefore, WADA prohibits its use.<sup>300</sup>

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<sup>299</sup> T. Bassindale et al., "Disposition of Androstenedione and Testosterone Following Oral Administration of Androstenedione to Healthy Female Volunteers; Influence on the Urinary T/E Ratio. " (paper presented at the Recent Advances in Doping Analysis, Cologne, Germany, 2002).

<sup>300</sup> It was likely adopted in the first WADA code from the IOC which had banned its use in 1997. The United States FDA banned its sale in 2004 and in 2005 under the Anabolic Steroid Control Act of 2004 it became classified as a controlled substance.



Through this study Bassindale and his colleagues produced women as hormonally distinct from men and by analogy female athletes as hormonally distinct from male athletes. Like Aguilera and his colleagues, these researchers relied on similarities between the group, women, and female athletes to produce their methods of authenticating the hormonal gender states of female athletes. Further, they produced additional terms of authentic hormonal gender states for female athletes through proposed evaluation criteria for androstenedione use. Specifically, Bassindale and his colleagues evaluated the efficacy of the T/E ratio, GC-MS, and GC-C-IRMS as alternative detection techniques for androstenedione use in female athletes through the proxy group of three “female volunteers.” They, then, provided grounds for detecting potential “women” endogenous androgenic substance users differently than “men” users.<sup>301</sup> Female athlete endogenous steroid use marked an illegitimate form of hormonal gender different from those marked for men. Although, under these authentication practices both forms render endogenous steroid users as ab-normal and transgressive.

In this study, Bassindale and his colleagues used three female volunteers aged 20, 23 and 25 years old to study the effects of a single dose of androstenedione. They chose these volunteers because their ages reflected the age range of competing female athletes (generally assumed to be 18-34).<sup>302</sup> With this these researchers implicitly bound authentic hormonal gender for female athletes to an age range that roughly corresponds to “optimal” reproductive years for women.<sup>303</sup> Bassindale and his colleagues, hence, required these women to use oral contraception---introducing more estrogen and progestogen---to prevent potential fetal harm during the experiment.<sup>304</sup> Bassindale and his colleagues assigned reproductive responsibility to these women and wanted to prevent fetal harm while these females experienced an

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<sup>301</sup> Committee, "Reporting and Evaluation Guidance for Testosterone, Epitestosterone, T/E Ratio and Other Endogenous Steroids. .", 2, 6.

<sup>302</sup> Bassindale et al., "Disposition of Androstenedione and Testosterone Following Oral Administration of Androstenedione to Healthy Female Volunteers; Influence on the Urinary T/E Ratio.", 52.

<sup>303</sup> Susan Bewley, Melanie Davis, and Peter Braude, "Editorial: Which Career First?," *British Medical Journal* 2005, no. 588 (2005). They also state, "The most secure age for childbearing remains 20-35."

<sup>304</sup> Bassindale et al., "Disposition of Androstenedione and Testosterone Following Oral Administration of Androstenedione to Healthy Female Volunteers; Influence on the Urinary T/E Ratio.", 52. The introduction of more estrogen and progestogen to these women was not viewed as a complication to be considered. These hormones are not viewed as performance enhancing in the same sense as the “male” hormones---testosterone and other endogenous androgenic steroids.

unauthentic gender state. This reproductive worry does not enter into the prior male administration studies and it bounds females and female athletes as potential reproducers. Implicitly, authentic hormonal gender states for females and female athletes entail a reproductive capacity laden with reproductive responsibility.<sup>305</sup>

Bassindale and colleagues also drew on previous studies to produce hormonal distinctions between men and women. These distinctions became particularly punctuated for androstenedione use. The distinctions also had the effect of producing males as more normal than females. Previous researchers demonstrated that androstenedione minimally affected male serum testosterone levels.<sup>306</sup> However, in women “about 60% of circulating testosterone is derived from the metabolism of androstenedione.”<sup>307</sup> Bassindale and his colleagues determined that daily use of androstenedione (100 mg) would aid female athletes.<sup>308</sup> With this they produced a hormonal distinction that marked male testosterone production and metabolism as less susceptible to androstenedione, and, therefore, more normal than similar female processes. Hence, this allowed female athletes to gain a hormonal advantage from the androgenic effects of low-dose androstenedione unavailable to male athletes. Taking androstenedione would raise the testosterone levels of women and by proxy female athletes above their physiological<sup>309</sup> “natural” levels and this increase would allow these women and female athletes to build more than “natural” muscle mass and gain “unnatural” strength. This hormonal distinction between women and female athletes and men and male athletes worked to further naturalize testosterone production and the related effects of testosterone as more aligned with male authentic forms of hormonal gender than female forms.

These researchers found that after administration (of 100 mg androstenedione) the T/E ratios of the three female subjects were elevated above the IOC threshold (and later the WADA threshold) for 4 to

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<sup>305</sup> Cynthia Daniels, "Between Fathers and Fetuses: The Social Construction of Male Reproduction and the Politics of Fetal Harm," *Signs* 22, no. 3 (1997)., Bassindale's work operates much like the narratives around “addict mothers” who are assigned the responsibility (or blame) for the outcome of their pregnancies.

<sup>306</sup> Bassindale., 51.

<sup>307</sup> *Ibid.*, 51.

<sup>308</sup> *Ibid.*, 59.

<sup>309</sup> *Ibid.*, 51.

10 hours in 2 subjects and 24 hours in the third. Hence, they determined the T/E ratio threshold did little to prevent female athletes from using androstenedione and gaining the associated athletic advantage. The T/E ratio stood as a poor indicator of authentic female hormonal gender for female athletes using androstenedione. Bassindale and his colleagues turned to GC-MS and GC-C-IRMS detection techniques to prevent female athletes from using this endogenous steroid to gain hormonal and muscular advantages over their non-using female competition.

These researchers proposed detection criteria through their GC-MS and GC-C-IRMS findings capable of policing such hormonal gender transgressions. Although they suggested more development before using GC-MS as diagnostic, Bassindale and his colleagues demonstrated that  $6\beta$  OH metabolites of androstenedione could indicate administration of this hormone. Likewise, using GC-C-IRMS they calculated the pre-administration  $\delta^{13}\text{C}$  values for androsterone and etiocholanolone as well as their 2.5 and 3 standard deviation values, thus, instantiating new “norms” for women and female athletes. Values outside of 3 standard deviations from the mean “were chosen to be outside the normal range for individuals and instrumental variability,”<sup>310</sup> hence, indicative of androstenedione use and illegitimate hormonal gender states.

Bassindale and his colleagues demonstrated that GC-MS and GC-C-IRMS could detect endogenous androgenic use in female athletes through their proxy “normal” women. Unlike the T/E model, GC-C-IRMS was shown to have greater sensitivity for detection in *this* athlete population. It could detect the use of small doses for longer periods of time than the T/E threshold. When used as a primary detection technique GC-C-IRMS shifted the authentic hormonal parameters for female athletes; specifically, with it these researchers constructed androstenedione induced states as illegitimate. These researchers worked to eliminate this hormonal hypermasculinity afforded to these female athletes through the threshold ratio. However, the threshold T/E ratio remained the primary indicator of endogenous androgenic substance use, thereby allowing for synthetic hormone-produced hypermasculinity in female

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<sup>310</sup> Ibid., 58.

athletes. Yet, Bassindale and his colleagues had produced authentic hormonal gender for female athletes as aligned with reproductive capacity and responsibility, more susceptible to “androgenization” through androstenedione use than their male counterparts, and partial measurable via the  $\delta^{13}\text{C}$  values of androstenedione metabolites.

***Longitudinal Studies: Creating Subject-Based Reference Ranges and Multiplying Available Authentic Hormonal Genders.***

In 1995, Manfred Donike and his colleagues called into question the population-based reference ranges they had previously established for the detection of endogenous steroids.<sup>311</sup> Based on the ratio of intra- to inter-individual variation they determined that the T/E ratio would be better measured by subject-based reference ranges than population-based cutoffs and that population-based reference ranges for T/E were quite insensitive to individual variations.<sup>312</sup> Hence, individual athletes could increase their T/E ratios by quite a bit without being detected.<sup>313</sup> To address this issue, these researchers sought a model of testosterone metabolism which could predict and evaluate individual T/E ratio changes. Donike and his colleagues proposed a homeostatic model for testosterone metabolism based on a study of six male volunteers. Under this model the observed value could be compared to the mean value of a time series of samples to determine whether or not the athlete in question was using endogenous androgenic hormones.

With this, Donike---the “father” of the T/E ratio based on population data---prompted the creation of subject-based reference ranges through “longitudinal studies.” These differed from previous longitudinal studies. The population-based norms of the older longitudinal studies were increasingly replaced by subject-based norms; however, these norms remained partially based on the population-based ranges. Since this study subject-based data has gained more importance in endogenous steroid detection practices. Longitudinal studies and subject-based references ranges seemed to increase the number of

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<sup>311</sup> M. Donike, U. Mareck-Engelke, and S. Rauth, "Statistical Evaluation of Longitudinal Studies, Part 2: The Usefulness of Subject Based Reference Ranges in Steroid Profiling" (paper presented at the Recent Advances in Doping Analysis Cologne, Germany, 1995).

<sup>312</sup> Ibid., 159.

<sup>313</sup> Ibid., 159.

available authentic hormonal genders by using individual athletes as their own reference range. However, this seeming multiplication of genders was truncated by population-based data thresholds and taken-for-granted dichotomous sex categories.

*The Cologne Protocol: A Definition of Longitudinal Study for Anti-Doping Researchers.*

Several of researchers working in Cologne with Donike formulated “The Cologne Protocol to Follow Up High Testosterone/Epitestosterone Ratios” two years after their work on subject-based reference ranges.<sup>314</sup> This protocol defined “longitudinal studies” of athletes through its endocrinological studies. Previously, longitudinal studies within anti-endogenous androgenic substance research had many meanings. It had meant any time-period study in which hormonal data was gathered to produce knowledge of androgenic hormone excretion patterns. It had also meant time-period urinary excretion studies of athletes with suspicious T/E ratios. In the Cologne Protocol, Donike and his colleagues required an endocrinological study when one of the population-based thresholds was breached; they defined this study as the collection of all urine fractions for a 48 hour period (at least five of which had to be supervised by a laboratory staff member). Hence, longitudinal studies of athletes for endogenous substance detection became time-based urine hormone profile studies and alternative means of evaluating authentic hormonal gender for regulating those that broke population-based sex dichotomized norms. Implicitly, athletes under study were deemed potentially transgressive at this point then the study confirmed or legitimated their non-normal hormonal gender state.

Specifically, these anti-doping researchers calculated the “subject-based reference range for the TEST/EPIT ratio and the normal variation of the other TEST related steroid ratios.”<sup>315</sup> Then they compared these values to the suspicious sample and decided if an athlete had used an endogenous androgenic substance.<sup>316</sup> The Cologne researchers required coefficients of variation between 10% and

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<sup>314</sup> H. Geyer et al., "The Cologne Protocol to Follow up High Testosterone/Epitestosterone Ratios" (paper presented at the Recent Advances in Doping Analysis, Cologne, Germany, 1997).

<sup>315</sup> Ibid., 118.

<sup>316</sup> Ibid., 118.

25% for the four steroid ratios: Testosterone/Epitestosterone, Androsterone/Testosterone, Androsterone/Epitestosterone, and Androsterone/Etiocholanolone, to calculate these subject-based reference ranges. If the coefficient of variation fell outside of this range then the screeners needed to gather more data until meeting this condition. Hence, these coefficients of variation served as the next legitimacy screen for the hormonal gender state of the athlete. From this data they established the subject-based ranges and standard deviations based on the 48 hour urine sample collection. Then, the anti-doping researchers established the mean value of the individual athlete and their subject-based range. Like other anti-doping limits, the Cologne researchers defined authentic hormonal gender as the mean plus or minus three standard deviations for an individual athlete. Anything outside of this range became grounds for claiming an athlete had used endogenous androgenic substances, i.e. exhibited an unauthentic hormonal gender.<sup>317</sup>

Although a subject-based range replaced population-based ranges as the final arbiter of the moral integrity of athletes under the Cologne protocol, these researchers still looked to population-based ranges to determine the cause of increased T/E ratios.<sup>318</sup> By comparing the subject-range to the population-range they could determine which athletes were low epitestosterone excreters, i.e. naturally high T/E individuals. These researchers aimed to eliminate false positive results through this comparison, and, thereby protect naturally high T/E male athletes from accusations of doping. Likewise, these researchers sought to detect more cheating athletes, i.e. eliminate more false negatives. However, male athletes with high T/E ratios and high testosterone concentrations were perceived to threaten fair play and implicitly those who remained below the threshold values did not. In the Cologne protocol these researchers both enacted a shift towards using longitudinal data to calculate subject-based reference ranges and the entrenchment of population-based values as thresholds for further testing.

These early longitudinal studies also marked part of the shift from universal norms to universal methods in endogenous androgenic substance detection. Population-based (universal) reference ranges no

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<sup>317</sup> *Ibid.*, 122-123.

<sup>318</sup> *Ibid.*, 123.

longer worked to defend authentic gender(s) and non-cheating athletes from endogenous androgenic substance users. Yet, population-based data still served as grounds for establishing categorical sex differences in hormones. Now, longitudinal studies served as the tool with which these researchers authenticated hormonal genders---that is they used longitudinal studies to determine if an athlete of either sex was using endogenous androgenic substances. These researchers no longer viewed population-based thresholds as the sole means for making such determinations. Under these early longitudinal studies, authentic hormonal gender states also became more than the measure of the T/E ratio; rather, it became a measure of the mean steroid ratios plus or minus three standard deviations per athlete breaching the population-based threshold. Authentic hormonal gender underwent a multiplication but was still informed by population-based ranges.

Hormonal hypermasculinity still existed as an available gender, largely to male athletes, through the longitudinal study approach. This hormonal hypermasculinity, i.e. males with “naturally” elevated T/E ratios, and those who excreted low amounts of testosterone could be better monitored for endogenous androgenic substance use through the longitudinal approach. This better detection method augmented more individualized terms of authentic hormonal gender while relying on the old biological sex categories.

*Longitudinal Study Use in the 2004 WADA Technical Document on Endogenous Androgenic Anabolic Steroids*

As stated before, the 2004 technical document on Endogenous Androgenic Anabolic Steroids shifted the role of the T/E threshold. The T/E threshold became a screening criteria for further testing. It also instantiated what further testing should look like: GC-C-IRMS analysis and longitudinal studies. The WADA defined a longitudinal study as three urinalyses, before and/or after a suspicious result, building off of the work of the Cologne group.<sup>319</sup> Researchers would determine basal T/E values per athlete, their

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<sup>319</sup> The WADA TD2004EAAS heavily cites Donike and his group’s work on steroid profiling and longitudinal studies. Bassindale’s work with females is also cited. Other anti-doping researchers

mean T/E ratio, standard deviation (SD) and coefficient of variation (CV) from these urine samples. The WADA defined basal values as the T/E values and other steroid values as determined during the longitudinal study urinalyses of an athlete. Obtaining basal values essentially meant obtaining a steroid profile over the time course of three urinalyses.

The 2004 WADA technical document specified that their CV should be less than 30% for male athletes and less than 60% for female athletes owing to the lower testosterone excretion rates in female athletes and therefore higher variability. If their CV did not meet the aforementioned requirements, as in Donike's protocol, more samples would be needed before the basal value and suspicious sample could be compared. The document does not specify what to do in the cases where the CV criteria cannot or are not met. Once researchers establish the CV criteria they can compare the longitudinal study steroid profile to the suspicious sample to determine if an athlete has used endogenous steroids.<sup>320</sup> When the researchers establish "significant" difference between the basal values and the suspicious sample of an athlete this indicates a doping positive, unauthentic hormonal gender, for that athlete.<sup>321</sup>

Although not specified, "appropriate statistical evaluation" and "significant" difference seem to mean a result outside of the 3 standard deviation range from the basal mean value of an individual athlete. Through the technical document this significant difference constituted "proof of the administration of a source of testosterone" on subject-based reference ranges.<sup>322</sup> With this new proof of administration came new means of raising suspicions; now, an athlete with an unstable steroid profile over time was also a suspected cheater.<sup>323</sup>

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contributed to the definitions of longitudinal studies and steroid profiles. Many of them have been addressed in the previous chapter.

<sup>320</sup> Committee, "Reporting and Evaluation Guidance for Testosterone, Epitestosterone, T/E Ratio and Other Endogenous Steroids.", 4.

<sup>321</sup> Ibid., 4.

<sup>322</sup> Ibid., 4.

<sup>323</sup> Ibid., 4.



**Table 7.** Replication of the List of Urinary Steroids Evaluated in A Longitudinal Study.

Urinary Steroid	Steroid Administered
Testosterone (G)	Testosterone, androstenedione, DHEA
Epitestosterone (G)	Epitestosterone
T/E (G)	Testosterone, androstenedione, DHEA
Androsterone (G)	Testosterone, DHT, androstenedione, DHEA, and androstenediol
Etiocolanolone (G)	Testosterone, androstenedione, DHEA, and androstenediol
DHEA (G)	DHEA
6 $\alpha$ -OH Androstenedione (G)	Androstenedione
6 $\beta$ -OH Androsterone (G)	Androstenedione
6 $\beta$ -OH Etiocolanolone (G)	Androstenedione
6 $\beta$ -OH Epiandrosterone (S)	Androstenedione
7 $\beta$ -OH DHEA/16 $\alpha$ -OH Androsterone (S)	DHEA
7-OH DHEA/7 keto DHEA	7 keto DHEA

*\*G indicates the glucuronide and S indicates the sulphate conjugation.*

This new evaluative criteria also redefined authentic hormonal gender as individualized. Each individual *suspected* athlete served as their own hormonal reference range and the statistical rule defining normal distribution authenticated their hormonal gender on this basis. Although this new individualized statistically authenticated hormonal gender appeared to radically break from the population-based criteria used previously, it did not. All of the initial criteria for further testing in the 2004 document remained population-based norms owing much to white males and white male athletes as explored in the previous chapter.

The new evaluative criteria simultaneously opened and circumscribed authentic hormonal gender for suspected hormone using athletes. Researchers produced this opening and closing through individual hormonal consistency over time after triggering one of the population-based thresholds. Under this model of hormonal consistency both male and female athletes who consistently excreted high T/E ratios could in theory be deemed “naturally” high T/E persons. Likewise, those on the lower side of testosterone excretion who triggered one of the population-based cutoffs could now be deemed testosterone cheats if they exhibited inconsistent T/E profiles. Longitudinal studies seemed to offer better detection at both ends of the testosterone excretion scale by defining authentic forms of hormonal gender in terms of consistency over time.

### ***Techniques for Evaluating Subject-Based Outcomes.***

#### *Bayesian Subject-Ranges and the new “Passport” approach.*

In 2007, Pierre-Eduard Sottas and his colleagues turned to a Bayesian model and method for detecting endogenous steroid use in elite sports.<sup>324</sup> Under this model the “T/E threshold progressively evolves as the number of individual test results increases.”<sup>325</sup> Sottas and his colleagues proposed an endogenous androgen “passport” model which was derived from a 2 year study following 17 amateur male athletes, 8 of these athletes received oral doses of testosterone undecanoate.<sup>326</sup> Further, these researchers developed more “norms” for categorizing and authenticating the hormonal gender states of each.

Sottas and his colleagues sought to erase the ambiguity of the proof of administration in the 2004 WADA technical document, which left “an open margin for the interpretation of the T/E profile.”<sup>327</sup> The

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<sup>324</sup> Pierre-Eduard Sottas works for the WADA European Regional Office in Lausanne, Switzerland as the Manager of the Athlete Biological Passport program. Previously, he worked for the Swiss Laboratory for Doping Analysis.

<sup>325</sup> Pierre-Eduard Sottas et al., "From Population- to Subject-Based Limites of T/E Ratio to Detect Testosterone Abuse in Elite Sport," *Forensic Science International* 174(2008)., 166. Much like the biological passport system used to detect blood doping.

<sup>326</sup> *Ibid.*, 166.

<sup>327</sup> *Ibid.*, 166.

insensitivity of the population-based T/E threshold allowed most athletes to artificially increase their T/E ratio by up to four times their “natural” physiological level without being considered dopers under the document and as the Cologne group had determined. By moving from both subject-based models and population-based models to a combined approach, the Sottas group claimed to have developed a “more sensitive test..of the marker [the T/E ratio]” than preceding approaches which only used one of these models.<sup>328</sup> The Sottas group sought to eliminate these artificially increased T/E ratios as legitimate forms of hormonal hypermasculine gender.

From these 17 male amateur athletes, the Sottas group looked at twelve distinct cases, representing scenarios faced by anti-doping researchers to demonstrate the efficacy and utility of their approach. The results of many of these scenarios are summarized in the following. Sottas and his colleagues could account for both sampling and physiological variability of the T/E ratio to determine the “true probability of a new test result in a population of male athletes<sup>329</sup>,” in other words, their test could distinguish between technical variability and physiological variability such that they could still predict the probability of further test results falling into the population range and subject range. Thus, they created a predictive form of legitimating and authenticating hormonal gender states.

Further, they claimed their model accounted for physiologically rare scenarios better than other statistical methods.<sup>330</sup> Sottas demonstrated that they could discriminate between those with naturally high T/E, those naturally larger than a 30% coefficient of variation (CV), those with both conditions, and those using endogenous steroids. Their model could provide probability rating for the endogenous steroid levels of an athlete when the GC-C-IRMS results remained inconclusive. They were able to determine that two of their athletes were receiving testosterone undecanoate even though they only registered a T/E value of 2.1 through this model. Hence, the Sottas group could authenticate such gender states when “natural” and render “unnatural” states illegitimate.

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<sup>328</sup> *Ibid.*, 167.

<sup>329</sup> *Ibid.*, 170.

<sup>330</sup> *Ibid.*, 170.

However, their model lacked the sensitivity to determine which of the low-mode individuals were receiving testosterone undecanoate, thereby demonstrating the difficulty of detecting testosterone use by these individuals.<sup>331</sup> Effectively, the Sottas group maintained low-mode individuals as a type of non-normal hormonal state incapable of achieving transgressive abnormality through these detection practices. Like the T/E screen used beforehand, this model maintained the mostly South Asian category as non-threatening sports masculinity even when doping.

Regardless, Sottas and his colleagues demonstrated the relevance of his detection method. As Pinch noted, the relevance of a test is a matter of projection and the establishment of a similarity relationship.<sup>332</sup> Projection requires the researchers to be able to scale their test to the setting where the technology will be used. This projection relies on assumptions of similarity. In the case of the threshold values, the researchers created difference where similarity was once assumed by suggesting that these values do not catch enough athletes using endogenous steroids. The case scenarios created similarities between the Bayesian approach and “actual” doping tests. These researchers built similarities between what counted as doping athletes under the Bayesian model and to the WADA or anti-doping researchers conducting WADA detection procedures. The researchers offered new terms for authenticating hormonal gender based on the similarities they created between their hybrid population-subject Bayesian model and anti-doping scenarios. This new model required continuous monitoring of athletes for hormonal gender transgressions. In this model, consistency in the hormonal profile of each athlete overtime supplanted the initial population-based hormonal profiles used to produce authentic hormonal gender.

Initially, endogenous steroid detection persisted as a problem in low-mode individuals. In an editorial piece, Larry Bowers---the Chief Science Officer of the United States Anti-Doping Agency---noted this problem. He saw potential in the Bayesian approach developed by Sottas and his colleagues for detecting these individuals. Bowers also noted that GC-C-IRMS would detect testosterone use but not if it

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<sup>331</sup> Ibid., 171.

<sup>332</sup> Pinch, "Testing- One, Two, Three...Testing!: Toward a Sociology of Testing.", 28-29.

was only employed when the T/E ratio threshold was breached.<sup>333</sup> Bowers, like many proponents of longitudinal steroid profile studies, saw too much ambiguity in the threshold values for determining authentic hormonal gender transgressions.<sup>334</sup>

Subject-based evaluations seemed to be gaining momentum as an alternative testing regime to catch more athletes using endogenous steroids, i.e. having illegitimate, ab-normal, gender states.<sup>335</sup> Like the GC-C-IRMS and prior Longitudinal Studies, the predictive subject-based model also worked to define authentic hormonal gender. Again, individual hormonal excretions and their consistency marked authentic hormonal levels per biological sex category. Again, population-based ranges combined with biological sex category provided the grounding for initial screening. In theory, low-mode individuals could be caught doping through this process because they would set their own reference ranges over time, thereby making inconsistencies in that range the marker of testosterone doping and authentic hormonal gender.

In his 2010 work, Sottas and his colleagues added to their Bayesian model the parameters of age, genetic type, and “ethnic” group.<sup>336</sup> Thus, authentic hormonal gender became individualized based on these categories. For example, genetic type, either deficiencies in UGT2B7 gene or UGT2B17 gene deficiencies could be used to predict athletes’ who were likely to be high or low T/E individuals respectively. This had the effect of further marking both categories as non-normal. Likewise, “ethnic” origin could also predict who was likely to be a low T/E excreter and be used as a discriminating factor for evaluating T/E values according to their model.<sup>337</sup> And, again, “ethnicity” marked non-normal categories of hormonal gender.

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<sup>333</sup> Larry D. Bowers, "Testosterone Doping: Dealing with Genetic Differences in Metabolism and Excretion," *Journal of Clinical Endocrinology and Metabolism* 93, no. 7 (2008).

<sup>334</sup> I do not mean to suggest that longitudinal study proponents stood in opposition to GC-C-IRMS proponents at all. These two groups often worked together to negotiate

<sup>335</sup> Thomas P. Hughes, "Technological Momentum," in *Does Technology Drive History?: The Dilemma of Technological Determinism*, ed. Merritt Roe Smith and Leo Marx (Cambridge: Massachusetts Institute of Technology Press, 1994). While one cannot mention momentum without mentioning Hughes, I find it necessary to say that by momentum I do not mean some technologically determinist variant. Rather, the point is that momentum is gained through the negotiations of anti-doping researchers and anti-doping regulators.

<sup>336</sup> Sottas, Saugy, and Saudan, "Endogenous Steroid Profiling in the Athlete Biological Passport."

<sup>337</sup> *Ibid.*, 63.

Sottas and his colleagues termed this new model the “Athlete Steroid Passport” and though they realized that it would not detect all testosterone and endogenous steroid users it would “ensure that the athlete will participate close to his natural, unaltered physiological condition.”<sup>338</sup> With the Athlete Steroid Passport Sottas and his colleagues reframed authentic hormonal gender both as defined by a range of categorical types and consistency in individual data collection.

### *Conclusions.*

From the 1990s to 2011, anti-doping researchers looked at, tested and enacted a variety of alternatives to the T/E threshold ratio. Through these tests they sought to “better” determine which athletes were using endogenous steroids. In doing so, these researchers created categories of athletes that included: high T/E excreting men, low-mode men, women, those with genetic deletions effecting testosterone metabolism, and categories related to sex hormone excretion levels, like young men, juvenile boys, old men, and menstruating women. The process of producing “better” tests allowed for forms of procedural equity through the application of these methods that WADA enacted. This “fairness,” produced through the creation of alternative tests and athlete categories, set the terms of authentic hormonal gender.

However, the anti-doping researchers based this “fairness” on the binary separation of the biological sex categories. This “fairness” structured their authentication of hormonal gender for athletes, thereby making life tenuous for those who do not fit neatly into one of the binary sex categories. Each of their approaches also offer possibilities for dismantling the binary, yet, these researchers consistently bound the multiplicity of authentic gender possibilities to the binary sex categories. My concept of authentic hormonal gender makes these gender possibilities more visible; with this concept space exists for multiple hormonal genders that need not be structured strictly by the binary biological sex categories.

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<sup>338</sup> *Ibid.*, 70.

Now, I turn towards a few of these possibilities and the differing forms of “fairness” that may be experienced through them. I ask, can we conceive of “fairness” based on different, multiple authentic hormonal genders that are not bound by the biological sex categories? Can we have fairness that does not assume we must keep these binary categories separate in competition? And, do the methods put forth by these researchers offer other possibilities for authenticating hormonal gender in such a way?

First, population-based thresholds produce room for both male and female athletes to experience a range of forms of hormonal masculinity and hypermasculinity that many of the other methods limit. For example, under the T/E threshold approach, all athletes can obtain this ratio without moral judgement of their hormonal authenticity. Here the threshold forms a theoretically permissible equity in access to hormonal hypermasculinity. This form of hormonal equity assumes all athletes begin with similar hormonal levels. Subsequently, anti-doping researchers have shown this is not true and in practice these population-based thresholds grant white male athletes preferential access to hormonal hypermasculinity as discussed in the previous chapter. Under this model “low-mode” males and females seldom achieve this form of authentic hormonal hypermasculinity due to differences in the metabolism of testosterone for these groups.

Second, GC-C-IRMS offers a model of authenticating hormonal gender use based on the consistency of carbon isotope values per individual athlete. GC-C-IRMS also offers models for authenticating hormonal gender based on population-derived values and values obtained from synthetically produced hormones. However, here, I will focus on the individualizing model. Biological sex, genetic type, and age need not affect hormonal authenticity through this model. Under this model the carbon isotopic values of testosterone, testosterone metabolites, testosterone precursors and additional hormones authenticate hormonal gender.

While Aguilera and his colleagues compiled much of his work on males and male athletes to compare their population values to individual values, in theory GC-C-IRMS does not require this comparison. The only required evaluative comparison is individual based---that between the endogenous steroids carbon isotope value and an endogenous reference compound as Aguilera and his colleagues

demonstrated. GC-C-IRMS produces a uniquely individualized and procedural equity for judging hormonal authenticity of athletes. Athletes could exhibit a range of hormonal hypermasculinities, hormonal low-mode excretion, or hormonal femininities and be judged solely on their carbon isotope values. In practice population-based, sex-separated thresholds form the screening criteria for undergoing GC-C-IRMS. Certainly, using carbon isotope values also presents challenges to attaining equity. This model relies on the stability of carbon isotopes in an individual athlete. Carbon isotope levels are known to be effected by geographical location and diet; both of which change frequently for elite level athletes traveling to multiple venues throughout their athletic careers. However, if used as the main criteria for authenticating hormonal gender GC-C-IRMS would allow for a multiplicity of forms as long as the athletes demonstrated consistent carbon isotope values.

Likewise, early subject-based studies and longitudinal studies evaluated authentic hormonal gender through hormonal consistency. Although population-based threshold values triggered the use of these alternatives, athletes could be judged based on their own hormonal consistency, thereby authentic hormonal gender becomes a mix of categorical population types and individual consistency. Again, early subject-based models produced individualized and procedural equity for judging hormonal gender in athletes. Athletes served as their own reference point and underwent the same methods of analysis after they breeched population-based thresholds.

These studies also formed a hybrid fairness for authentic hormonal masculinity. Athletes could exhibit a range of hormonal gender forms as long as they were consistent. The preset screening criteria did not limit access to hormonal hypermasculinity as expressed by high T/E individuals nor does it exempt low-mode individuals from further testing solely based on their screening criteria results. Through this model fairness is not obtained through the comparison of the hormone levels of an athlete to population values, rather, the fairness instantiated in this form arises from the equal treatment of the athletes tested. These anti-doping researchers assumed that hormonal levels per athlete remain individually consistent and somewhat homeostatic over time. In theory, this model can also detect consistent dopers by observing variations in hormone precursors which undergo amount changes related



to the doping. In practices, this model made available a range of consistent hormonal states for individual male athletes while not rendering the same range for female athletes.

In the Bayesian approach fairness also stems in part from the equal treatment of the athletes tested and a multiplicity of hormonal genders available to these athletes. However, as Sottas and his colleagues have constructed this approach, these hormonal genders are circumscribed by age, biological sex, “ethnic” origin, and genetic (phenotypical) type. While these researchers assumed a consistent and homeostatic model of hormonal levels per athlete for their testing, they also desired to “ensure that the athlete will participate close to his natural, unaltered physiologic condition”<sup>339</sup> making clear the assumptions that the aforementioned categories affect natural hormonal levels. The Bayesian approach attempts to grant fairness in this way---a multiplicity of authentic hormonal genders can exist as long as they approximate “natural” states as defined by age, biological sex, “ethnic” origin, and genetic type.

For me, the questions are: does authentic hormonal gender have to approximate *these* “natural” states? Can we approximate “natural” states without relying on the distinction and separation of biological sex categories? Can we define authentic hormonal gender without the biological sex categories and if we did what would sports look like afterwards? This chapter has opened up more questions for me than it has answered but I believe anti-doping research in this area holds promise for undoing the sex-gender binary deeply embedded in the sports and anti-doping worlds.

In practice, how would this newly opened cacophony of hormonal genders work in sports? There could be a multiplicity of leagues based on hormonal types. It seems these would inevitably mirror the dominant gender order, and, place more value on hormonally masculine bodies and sports. Hence, this too would reproduce an unfair system of sports. Instead of looking for technomedical avenues to resolve issues of equity and fairness, I propose we admit sports are not “fair” because “fairness” is a discursive category within sports and anti-doping efforts. As such, “fairness” is an always contested domain. Sports governing bodies seek to preserve “fairness” for each biological sex category, while these anti-doping

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<sup>339</sup> Ibid., 70.

researchers seek to preserve “fairness” through the hormonal integrity of each athlete. This recasts the doping debates, as more than the familiar cat and mouse game of use and detection, to competing articulations of “fairness” bound to competing articulations of gender. From this position, we can work towards developing new technomoralities of “fairness” that shift the gender domain of sports.

### **Conclusion: Disrupting “Fairness” and the Binary Sex Sport System.**

Blood doping and doping detection researchers produced many ab-normalized and hormonally authenticated athletes as they defined and refined “doping,” producing technomedical and technomoral categories in the process. They also reproduced biological sex categories, thereby maintaining the “natural” superiority of male over female athletes and upholding certain White Western male types as the dominant categories. More succinctly, blood doping and anti-endogenous steroid detection practices produced different gender and race categories while often upholding dominant gender and race power relations.

#### ***Blood Doping and Ab-Normalized Athletes.***

Before blood doping solidified, researchers co-produced “male endurance athletes”---as trained otherwise “normal” men---and the technomedical practice of blood doping. In Chapter 2, I explore how these researchers normalized their subjects and blood doping practices while being shielded from social concerns through an ethics of uncertainty. Blood boosting and blood doping researchers produced a series of categories: the normal, non-deviant; the non-normal, desired or assumed deviant; and the abnormal, illegitimate deviant. “Male” thus became the designation for the non-deviant norms, developed through standard indicators, timetables, and blood doping practices. Subsequently, blood doping researchers solidified blood doping as a technomoral entity in the 1987 ASCM position stand; these North American researchers condemned the practice as a means of enhancing athletic performances while they demanded a technical means of detecting its use. Blood doping had shifted from a socially condemned practice to a technomedically condemned practice.

In the case of blood doping, multiple categories outside of the non-deviant norm are named and normalized through the development of this technical practice. Hence, in Chapter 3, I turn to ab-normalization. Through ab-normalization norms are set both in relation to the non-deviant norms and to other non-normal categories; such as “normal” males embody a non-deviant norm while “male endurance athletes” and other “male athletes” become non-normal categories. Ab-normalization created a space for

policing the “moderately” and desired deviance of elite endurance athletes, and, thus, defined the “fair” ways elite endurance athletes could and should surpass their “normal,” non-trained (gender) counterparts.

North American blood doping and boosting researchers also constructed a new set of “norms” based on the ab-normal bodies of “female endurance athletes.” In the case of female blood boosters abnormalization makes visible their simultaneous “normalization”---how data collected from their bodies became technomedical ideals---and their construction as non-normal deviants relative to the non-deviant “normal” male. These researchers created the norms of this non-deviant male through witnessed and mathematically standardized responses to blood re-infusion and they used these norms to make sense of their female subjects. In turn, female endurance athletes were made sense of through the non-normal female category, the norms established for the non-deviant male category, and those of the non-normal male endurance athlete. Hence, blood doping and boosting researchers defined “female endurance athletes” as having less oxygen carrying capacity in their blood than “normal” males and more oxygen carrying capacity than “normal” females.

Constructed in this way, these blood doping and boosting researchers created female athletes as potentially double transgressives. Female endurance athletes with an excess of hemoglobin beyond that of “normal” men potentially transgressed both gender norms and moral norms of fairness. This double transgressive potential sustains the male-to-female gender stratification within sports and establishes “fair” for female athletes as different from “fair” for male athletes. “Fairness” for female competitors means retaining your (bloody) femininity and not blood doping. Yet, these researchers aligned male competitors with the “norm” of blood doping, and, hence, the male form of “fairness” exists as a fairness premised on the morality of blood doping alone.

### *Endogenous Steroid Detection and Authenticating Athletes.*

In Chapter 4, I trace how Western anti-doping researchers worked to multiply the available forms of authentic hormonal masculinity for male and female athletes during the 1980s and 1990s. They co-produced these new authentic forms of masculinity with challenges to existing detection techniques. Although these researchers multiplied the available forms of authentic masculinity, they also upheld a form of white Western male hypermasculinity as the ideal to be attained, mimicked and heightened by *all* male athletes. This form of masculinity was embodied in the high excreting or “naturally” high T/E individual.

More specifically, the use of testosterone and other endogenous anabolic steroids aligned with “bigger, faster, and stronger”<sup>340</sup> athletic performances by allowing users to gain more muscle mass and recover more quickly from training and competition. Anti-doping agencies set the T/E thresholds high to allow for “natural” high excreting individuals to compete. These high thresholds provided wide latitude for male athletes to embody such hormonal hypermasculinity without much scrutiny. Researchers struggled to find detection methods that would disallow these artificial hypermasculinities but allowed for the “natural” hormonal elevation found among some male athletes.

The latter part of Chapter 4 explores how female athletes presented their own challenges for anti-doping researchers seeking to authenticate hormonal masculinity. These female athletes challenged the physical limitations of the detection techniques used to establish T/E thresholds; they excreted testosterone at barely detectable levels. Individual female athletes also challenged these researchers when they excreted above threshold T/E values. This was similar to the challenge of false positive men who these researchers often deemed “natural” high excreters. However, they did not grant these females the same “natural” status. Rather, they drew upon the personal veracity of these female athletes to justify and perform studies that effectively maintained their femininity. Hence, hormonal hypermasculinity was an

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<sup>340</sup> Christopher Bell, "Bigger, Stronger, Faster.," ed. Christopher Bell (USA: Madmen Films, 2008). Bell's title alludes to both the Olympic motto, "Faster, higher, stronger" and "better, stronger, faster," from the opening sequence of the *Six Million Dollar Man* TV series.

illegitimate form of masculinity for these female athletes that was countered through the maintenance of their femininity.

Although I largely leave the relationship between authentic hormonal masculinity and ab-normalization implicit in Chapter 4, these anti-doping researchers ab-normalized the categories formed with testosterone and endogenous steroid detection methods. Western, white, male hormonal hypermasculinity served as the pinnacle form of athletic masculinity---a non-normal but desired form---that male athletes should attempt to attain. Likewise, female athletes should mimic this form without attaining it, hence, situating female athletes as a hormonally lesser non-normal category.

Like the ab-normalization of blood doping, authenticating hormonal hypermasculinity rendered this desired deviance in athletes policeable, and, this produced new forms of “fairness” in competition. These anti-doping researchers policed the boundaries of hormonal hypermasculinity for male athletes and the boundaries of hormonal masculinity, femininity, maleness, and femaleness for female athletes. This “fairness” for male athletes was premised on defining hormonal hypermasculinity in relation to T/E cutoff values- an approach that left space for “natural,” and thus legitimate, transgression. Further, a legitimate form of transgression could also be granted to certain male athletes who consistently excreted above the cutoff value. Again, these athletes were deemed “natural” high excreters.

The anti-doping researchers constructed “fairness” for these female athletes, on the other hand, within the cutoff hormonal values as a way to protect female athletes from male imposters. Female athletes, including intersexed and “naturally” high female T/E excreters, attaining T/E defined hormonal hypermasculinity, were subjected to both gender and moral transgression claims, i.e. cast as double transgressives. Researchers defined these women as ab-normal, illegitimate deviants --- incapable of attaining norms relative to either their own or the dominant category.

In Chapter 5, I trace how anti-doping researchers tested and enacted a variety of alternatives to the T/E threshold ratio through the 1990s and 2000s. Through these tests they sought to “better” determine which athletes were using endogenous steroids. In doing so, these researchers created categories of athletes that included: high T/E excreting men, low-mode men, young men, juvenile boys,

old men, women, and menstruating women. The process of producing “better” tests allowed for forms of procedural equity through the WADA detection methods. Through this procedural equity anti-doping researchers and the WADA established new definitions of “fairness.” This new “fairness,” produced through the creation of alternative tests and athlete categories, reset the terms of authentic hormonal gender.

Nevertheless, the anti-doping researchers based this “fairness” on the same binary separation of the biological sex categories. This “fairness” structured their authentication of hormonal gender for athletes, thereby, again, making life tenuous for those who do not fit neatly into one of the binary sex categories. Each of their approaches offered possibilities for disrupting the binary, yet, these researchers consistently bound the multiplicity of authentic gender possibilities to the binary sex categories. I have made these gender possibilities more visible through the concept of authentic hormonal gender; this concept creates space for a multitude of hormonal genders that need not be bound to the biological sex categories.

### ***Disrupting “Fairness” in the Binary Sex Sports Doping System.***

Although authentic hormonal gender opens space for a cacophony of genders in sports, I have argued that in practice these genders consistently mirror the dominant sex/gender order of those producing them. That is as researchers and sports governing bodies produced new methods of authenticating these genders they also produced gender categories laden with power that privileges certain categories over others. These researchers reproduced sport as a binary segregated system laden with assumptions of male athletic prowess over female athletic ability. They worked to support this binary segregated system despite consistently witnessing a multiplicity of genders in their research.

These researchers produced forms of “fairness” through the reproduction and maintenance of the binary segregated system, which ensured that male athletes compete against other non-cheating (male) athletes, and, that female athletes competed against non-cheating female athletes and no male athletes.

Built into this “fairness” is the assumption that men are athletically superior to women, hence, women must be protected from “unfair” competition with men.

However, as illustrated throughout my dissertation, making bodies fit into these binary categories takes work. First in chapters 2 and 3, I traced the binary gender reinforcement that occurs in tandem with the production of blood doping and blood boosting---seemingly gender neutral performance enhancement technologies. Then, in chapters 4 and 5, I traced the gradual technical deconstruction of this binary through the attempts of anti-doping researchers to detect endogenous anabolic steroid use. Although these researchers expanded the array of available genders through their work, they also reenacted the binary sex and gender system as meaningful for authenticating these genders. If the technomedical researchers behind both the methods used for doping and the practices that catch athletes who use these methods consistently reenact and reproduce this binary segregated system in spite of evidence to the contrary, how then can we disrupt it? Could disrupting this system result in new forms of fairness? And, would those forms of fairness enable full participation for athletes outside of the binary system?

To think through what disrupting this system and its fairness might look like, I make two proposals and look at two previous approaches to the issue. Each of these have different disrupting potential. I believe ab-normalization provides a good starting point. Ab-normalization allows us to admit that athletes---male and female alike---exist as a non-normal category distinct from the non-deviant (normal) categories that often serve as the ground for technomedically judging them. Can we move away from using these non-deviant (normal) categories as the metrics of technomoral assessment? My first proposal requires that researchers use non-normal athlete categories to develop detecting methods for athletes, yet, this would retain the binary if not explicitly addressed.

These categories have already been conceived in part through the cacophony of genders produced in chapters 4 and 5 and this provides some imaginary space for moving forward. I imagine all those seeking to compete will undergo various hormonal gender typing. Then instead of being cast as authentic male or female athletes they would be assigned a hormonal gender league within which to compete. These leagues would work something like weight categories in boxing and wrestling, however, without



the assumption of binary separation. From within these hormonal gender categories, anti-doping researchers could still monitor and disallow those using steroids to participate while allowing a range of hormonal types to compete. Likewise, similar categorical types could be built for blood where those who naturally experience greater levels of RBCs may participate in different leagues than those who do not. At the outset, these new leagues seem to present new ways to conceive of “fair” play outside of the binary sex and gender segregation system. However, I wonder if this is truly possible?

Not only do I wonder if this is truly possible, I wonder if this hormonal gender scheme is desirable especially when the end goal for me is to accomplish some form of equity for those categories left out of or pathologized by a dichotomous system. This absence of categories and pathology of other categories often stems from the biomedicalization<sup>341</sup> of athletes and this scheme would just enforce a new biomedicalization of athletes. That is through this hormonal gender scheme athletes at all levels would be reconstituted and extended through the practices of biomedicine.<sup>342</sup> Athletes would be transformed into hormonally gendered athletes. Further, this biomedicalization might reach deeper into sports beyond the highly biomedicalized professional and elite groups to children’s sports and recreational leagues. For all sports, how would we assign a more equitable hormonal gender than we currently assign sex and gender? What processes would we use? Would they just recreate the hypermasculine model?

Perhaps, another approach to disrupting the binary sports system can offer more immediate forms of “fairness.” In 2009, Caster Semenya made headlines for smashing her competition and potentially being intersexed. It has since been confirmed that she is intersexed. During the past four years, many scholars have weighed in on her case. Those scholars often mark out new forms of “fairness” for such athletes. For example, Michael Kimmel argues that the gender binary is a “convenient cultural fiction,” and, since it is a cultural fiction Semenya should be capable of competing as a woman on social and

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<sup>341</sup> Adele Clarke et al., "Biomedicalization: Technoscientific Transformations of Health, Illness, and U.S. Biomedicine.," *American Sociological Review* 68(2003).

<sup>342</sup> *Ibid.*, 162.

cultural grounds alone.<sup>343</sup> In doing this, Kimmel marks out social gender identification and assignment as a space for allowing intersexed athletes to compete. However, he does not acknowledge the technomedical reality that these athletes face, and, hence, his approach does little to disrupt the current system.

Alice Dreger has also offered another approach to the conundrum faced by intersexed athletes. Alice Dreger recognizes gender as a cultural construction.<sup>344</sup> For Dreger both biological sex and gender are messy constructions. She recognizes that categorizing individuals as one or the other sex and gender requires multiple social decisions although she does not go so far as to say that biological sex exists as a social construction. Dreger recommends that officials “come up with a clear set of rules for sex typing” and apply this test to female athletes prior to competition.<sup>345</sup> Dreger proposes pre-competition sex typing as a way to ensure “fair” play, however, she does not say what to do with these results. Further, under these recommendations men would not be subjected to pre-competition sex typing. The difference in the Dreger recommendation would be that either all women would be pre-tested or women feared to be men would be pre-tested. Hence, her variant of “fairness” would be one based on equal treatment for all non-male competitors or at least those suspected of gender transgressions before competition.

Both Kimmel and Dreger leave the binary system intact while they assert these new forms of “fairness” for judging intersexed athletes. Their approaches hold promise for making life less tenuous for intersexed athletes. However, it seems more disruption could be accomplished than in either of these approaches. Perhaps, a third scholar can help us envision more disruption. In 2011, Susan Cahn weighed in on the Semenya case. She explained that when many people attribute gender to another individual “one male cue might signal maleness, [however] a ‘female’ cue, by itself, does not signal femaleness.”<sup>346</sup> This has resounding implications for female athletes who often exhibit “male cues.” This gender attribution

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<sup>343</sup> Michael Kimmel, "The Bigotry of the Binary: The Case of Caster Semenya," in *The Huffington Post* (Huffington Post.com, Inc., 2009).

<sup>344</sup> Alice Dreger, "Where's the Rulebook for Sex Verification?," *The New York Times* 2009.

<sup>345</sup> Ibid.

<sup>346</sup> Susan Cahn, "Testing Sex, Attributing Gender: What Caster Semenya Means to Women's Sports," *Journal of Intercollegiate Sports* 4(2011).

process exists as oppositional space. For me, this serves as a reminder that the male: female binary in sports exists more as the opposition male to non-male than a categorical space for two unique and related categories, male and female.

Hence, I offer my second proposal for dealing with the binary and making space for more people to play sports; it is to build a richer female category. This category should exist on its own terms. Female athletes should no longer be related to the non-normal female category, but, should instead be related to the normal, non-deviant, female category. All female athletes should be valued based on these new terms. With this valuing, I am proposing that we include intersexed women, women with AIS, women who are chromosomal males, transgender women, and all women who identify as women in this category for sport competition. We should cast out the fear of men masquerading as women to beat them in sports and start building this new non-essentialized category. Further, we should not pathologize women within this category that do not make the cut for previous notions of the “female” category. These newly accepted members should not have to undergo medical treatment prior to competing. Rather, we should embrace their potential “natural” superiority as we do for male athletes; then we will have achieved a “fairness” that allows these women to compete.

To do this we must acknowledge that there will be concerns about the more masculinized females dominating competition. These concerns will persist as long as we retain the binary system. However, we can also work to shift the model of athletics with the new female category. Specifically, we can shift from one where “fair” competition is based on a sex and gender separation that ensures “men” do not compete as women to one that values competition of all athletes especially those currently excluded or pathologized by the current binary system. To do this the new richer female category must make room for these athletes and sustain this new type of equity for them.

However, even this form of equity (“fairness”) allows for the re-articulation of the hypermasculine model of athletic. For it allows male sports to go uninterrupted---male sports are still reserved for “proper” male athletes. And, we have created a new “feminized” other category of athletes. The question remains, can this new “feminized” category allow for more equitable forms of competition

for those currently excluded? Are there other ways of envisioning competitive sport that allow the excluded categories to participate? What would we have to value in such sports? Is there another model of athletics outside of the hypermasculine to guide us?

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